

MATHEMATICS – P1

LAST PUSH



TRIALS MEMOS

ALL PROVINCES – 2026



Northern Cape
Department of Education



Compiled by



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QUESTIONS PER TOPIC

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**NATIONAL
SENIOR CERTIFICATE
*NASIONALE
SENIOR SERTIFIKAAT***

GRADE/*GRAAD* 12

SEPTEMBER 2026

**MATHEMATICS P1 MARKING GUIDELINE /
*WISKUNDE V1 NASIENRIGLYN***

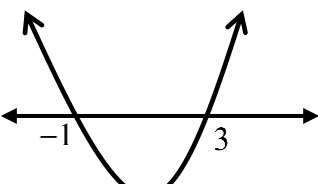
MARKS/*PUNTE*: 150

This marking guideline consists of 15 pages./
Hierdie nasienriglyn bestaan uit 15 bladsye.

NOTE/LET OP:

- If a candidate answered a question TWICE, mark the FIRST attempt ONLY.
Indien 'n kandidaat 'n vraag TWEE keer beantwoord het, merk SLEGS die EERSTE poging.
- Consistent accuracy(CA) applies in ALL aspects of the memorandum.
Volgehoue akkuraatheid geld deurgaans in ALLE aspekte van die memorandum.
- If a candidate crossed out an attempt of a question and did not redo the question, mark the crossed-out attempt.
Indien 'n kandidaat 'n poging vir 'n vraag deurgetrek het en nie die vraag weer beantwoord het nie, merk die poging wat deurgetrek is.
- The mark for substitution is awarded for substitution into the correct formula.
Die punt vir substitusie word toegeken vir substitusie in die korrekte formule.

QUESTION/VRAAG 1

1.1	1.1.1	$2x(x-3)=0$ $2x=0$ or/of $x-3=0$ $x=0$ or/of $x=3$	✓ factors / faktore ✓ both answers / beide antwoorde (2)
	1.1.2	$2x^2 + 5x + 1 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-(5) \pm \sqrt{(5)^2 - 4(2)(1)}}{2(2)}$ $x = \frac{-5 \pm \sqrt{17}}{4}$ $\therefore x = -0,22$ or / of $x = -2,28$ Penalise 1 mark for incorrect rounding off./ Penaliseer 1 punt vir verkeerde afronding.	✓ standard form / standaardvorm ✓ substitution / vervanging ✓ answer / antwoord ✓ answer / antwoord (4)
	1.1.3	$-x^2 + 2x + 3 > 0$ $x^2 - 2x - 3 < 0$ $(x-3)(x+1) < 0$ c.v's / kritieke waardes : $x \in \{-1; 3\}$  $-1 < x < 3$	✓ standard form / standaardvorm ✓ critical values / kritieke waardes ✓✓ $-1 < x < 3$ (accuracy / akkuraatheid) OR/OF ✓✓ $x \in (-1 ; 3)$ (4)

1.1.4	$25^x - 26.5^x + 25 = 0$ $(5^x)^2 - 26.5^x + 25 = 0$ $(5^x - 25)(5^x - 1) = 0$ $5^x = 25$ or / of $5^x = 1$ $5^x = 5^2$ or / of $5^x = 5^0$ $x = 2$ or / of $x = 0$ OR / OF $(5^x)^2 - 26.5^x + 25 = 0$ let / laat : $5^x = k$ $k^2 - 26k + 25 = 0$ $(k - 25)(k - 1) = 0$ $k = 25$ or / of $k = 1$ $5^x = 5^2$ or / of $5^x = 5^0$ $x = 2$ or / of $x = 0$	✓ quadratic form / <i>kwadratiese vorm</i> ✓ factors/ <i>faktore</i> ✓ both equations / <i>beide vergelykings</i> ✓ both answers / <i>beide antwoorde</i> OR/OF ✓ quadratic standard form/ <i>kwadratiese standaardvorm</i> ✓ factors/ <i>faktore</i> ✓ both equations (after substitution)/ <i>beide vergelyking (na vervanging)</i> ✓ both answers / <i>beide antwoorde</i> (4)

1.2	$2x - y = 1 \dots\dots\dots(1)$ $x^2 - y^2 = xy - 11 \dots\dots\dots(2)$ From / Vanaf (1): $y = 2x - 1 \dots\dots\dots(3)$ (3) into/in (2): $(2x - 1)^2 - (2x - 1)^2 = x(2x - 1) - 11$ $x^2 - (4x^2 - 4x + 1) = 2x^2 - x - 11$ $x^2 - 4x^2 + 4x - 1 = 2x^2 - x - 11$ $-5x^2 + 5x + 10 = 0$ $x^2 - x - 2 = 0$ $(x - 2)(x + 1) = 0$ $x = 2$ or/of $x = -1$ $y = 3$ or/of $y = -3$ OR / OF $2x - y = 1 \dots\dots\dots(1)$ $x^2 - y^2 = xy - 11 \dots\dots\dots(2)$ From / Vanaf (1): $x = \frac{y+1}{2} \dots\dots\dots(3)$ (3) into/in (2): $\left(\frac{y+1}{2}\right)^2 - y^2 = \left(\frac{y+1}{2}\right)y - 11$ $\frac{(y+1)^2}{4} - y^2 = \frac{y(y+1)}{2} - 11$ $\frac{y^2 + 2y + 1}{4} - y^2 = \frac{y^2 + y}{2} - 11$ $y^2 + 2y + 1 - 4y^2 = 2y^2 + 2y - 44$ $-5y^2 = -45$ $y^2 - 9 = 0$ $(y - 3)(y + 3) = 0$ $y = 3$ or/of $y = -3$ $x = 2$ or/of $x = -1$	✓ $y = 2x - 1$ ✓ substitution / vervanging ✓ standard form / standaardvorm ✓ factors / faktore ✓ x-values / waardes ✓ y-values / waardes OR/OF ✓ $x = \frac{y+1}{2}$ ✓ substitution / vervanging ✓ standard form / standaardvorm ✓ factors / faktore ✓ y-values / waardes ✓ x-values / waardes
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(6)

1.3	$m(n(x)) = \frac{1}{2}$ $\left(3\left(\frac{x+2}{\sqrt{x+5}}\right) - 2\right) \div \left(4\left(\frac{x+2}{\sqrt{x+5}}\right)\right) = \frac{1}{2}$ $\left(\frac{3x+6}{\sqrt{x+5}} - 2\right) \div \left(\frac{4x+8}{\sqrt{x+5}}\right) = \frac{1}{2}$ $\frac{3x+6-2\sqrt{x+5}}{\sqrt{x+5}} \times \frac{\sqrt{x+5}}{4x+8} = \frac{1}{2}$ $\frac{3x+6-2\sqrt{x+5}}{2(2x+4)} = \frac{1}{2}$ $2x+4 = 3x+6-2\sqrt{x+5}$ $2\sqrt{x+5} = x+2$ $4x+20 = x^2+4x+4$ $x^2-16=0$ $(x+4)(x-4)=0$ $x=4 \text{ or/of } x \neq -4$	✓ substitution / <i>vervanging</i> ✓ adding fractions / <i>optel van breuke</i> ✓ simplification/ <i>vereenvoudiging</i> ✓ standard form / <i>standaardvorm</i> ✓ answer with selection <i>antwoord met keuse</i>
		(5)
		[25]
QUESTION/VRAAG 2		
2.1	2.1.1	7; 16; 25; 34;..... $a = 7$ and $d = 9$ $T_n = 7 + (n-1)(9)$ $= 7 + 9n - 9$ $= 9n - 2$
		✓ substitution / <i>vervanging</i> ✓ answer / <i>antwoord</i>
	2.1.2	$T_{35} = 9(35) - 2$ $= 313$
		✓ answer / <i>antwoord</i>
	2.1.3	$S_{35} = \frac{35}{2} [2(7) + (35-1)(9)]$ $= 5\,600$ OR / OF $S_{35} = \frac{35}{2} (7 + 313)$ $= 5\,600$
		✓ substitution / <i>vervanging</i> ✓ answer / <i>antwoord</i> OR/OF ✓ substitution / <i>vervanging</i> ✓ answer / <i>antwoord</i>
		(2)

	2.1.4	$8\,600 = \frac{n}{2} [2(7) + (n-1)(9)]$ $17\,200 = n(14 + 9n - 9)$ $17\,200 = n(9n + 5)$ $17\,200 = 9n^2 + 5n$ $9n^2 + 5n - 17\,200 = 0$ $n = \frac{-5 \pm \sqrt{(5)^2 - 4(9)(-17\,200)}}{2(9)}$ $n = 43,44 \text{ or / of } n = -43,99$ $\therefore n = 43$	✓ equating 8 600 to S_n Stel $S_n = 8\,600$ ✓ simplification / vereenvoudiging ✓ substitution / vervanging ✓ answer / antwoord (4)
2.2	2.2.1	Side = $\frac{1}{2}$ units/eenheid	✓ answer / antwoord (1)
	2.2.2	$\left(\frac{1}{2}\right)^2 = \left(\frac{1}{4}\right)^2 + h^2 \text{ (Pyth.)}$ $h = \frac{\sqrt{3}}{4}$ $\text{Area} = \left(\frac{1}{2}\right)^2 \times \frac{\sqrt{3}}{4}$ $= \frac{\sqrt{3}}{16} \text{ units}^2 / \text{eenhede}^2$	✓ height / hoogte ✓ area / oppervlakte (2)
	2.2.3	$\left(\frac{1}{4}\right)^2 = \left(\frac{1}{8}\right)^2 + h^2 \text{ (Pyth.)}$ $h = \frac{\sqrt{3}}{8}$ $\text{Area} = \frac{1}{2} \times \frac{1}{4} \times \frac{\sqrt{3}}{8}$ $= \frac{\sqrt{3}}{64} \text{ units}^2 / \text{eenhede}^2$ $\frac{\sqrt{3}}{4} + \frac{\sqrt{3}}{16} + \frac{\sqrt{3}}{64} + \dots$ $a = \frac{\sqrt{3}}{4} \text{ and/en } r = \frac{1}{4}$ $S_{\infty} = \frac{\frac{\sqrt{3}}{4}}{1 - \frac{1}{4}}$ $= \frac{\sqrt{3}}{3} \text{ units}^2 / \text{eenhede}^2$	✓ area / oppervlakte ✓ common ratio / gemene verhouding ✓ substitution/ vervanging ✓ answer / antwoord (4)

2.3	$T_n = S_n - S_{n-1}$ $= n(n+1)(2n+3) - (n-1)n(2n+1)$ $= n[(n+1)(2n+3) - (n-1)(2n+1)]$ $= n(2n^2 + 5n + 3 - 2n^2 + n + 1)$ $= n(6n + 4)$ $= 6n^2 + 4n$ $T_4 = 6(4)^2 + 4(4) = 112$ Alternative solution/Alternatieve oplossing: $T_1 = S_1 \quad ; \quad T_2 = S_2 - S_1 \quad ; \quad T_3 = S_3 - S_2 \quad ; \quad T_4 = S_4 - S_3$ $\therefore T_4 = S_4 - S_3$ $= 4(4+1)[2(4)+3] - 3(3+1)[2(3)+3]$ $= 220 - 108$ $= 112$	✓ $S_n - S_{n-1}$ ✓ simplification/ vereenvoudiging ✓ Substitution/ vervanging ✓ answer / antwoord ✓ $S_n - S_{n-1}$ ✓ substitution / vervanging ✓ simplification / vereenvoudiging ✓ answer / antwoord
		(4)
		[20]
QUESTION/VRAAG 3		
3.1	-18; -27	✓ -18 ; -27 (1)
3.2	$2a = -2 \quad 3a + b = 3 \quad a + b + c = 1$ $a = -1 \quad 3(-1) + b = -3 \quad -1 + 0 + c = -3$ $b = 0 \quad c = -2$ $\therefore T_n = -n^2 - 2$	✓ $2a = -2$ ✓ $3(-1) + b = -3$ ✓ $-1 + 0 + c = -3$ (3)
3.3	$-n^2 - 2 = -2603$ $n^2 - 2601 = 0$ $(n - 51)(n + 51) = 0$ $n = 51 \text{ or / of } n = -51$ $\therefore n = 51$	✓ standard form / standaardvorm ✓ answer / antwoord (2)
		[6]

QUESTION/VRAAG 4			
4.1	$q = -2$		✓ answer / antwoord (1)
4.2	$0 = \frac{-2}{x+3} - 2$ $2 = \frac{-3}{x+3}$ $2x+6 = -3$ $x = -4,5$		✓ $g(x) = 0$ ✓ multiplying by $(x+3)$ vermenigvuldig met $(x+3)$ ✓ answer / antwoord (3)
4.3	$h(x) = x+3-2$ $= x+1$ OR / OF $h(x) = x+c$ $-2 = -3+c$ $c = 1$ $h(x) = x+1$		✓ method / metode ✓ answer / antwoord (2)
4.4	$y = -2+1 = -1$ $-5 = x+1$ $x = -6$ $\therefore C'(-6; -1)$		✓ y-coordinate / koördinaat ✓ x-coordinate / koördinaat (2)
4.5	$p(x) = 2^x$ $p^{-1}(x) = \log_2 x$		✓✓ equation of p vergelyking van p ✓ answer / antwoord (3)
4.6	4.6.1	$-4,5 \leq x < -3$ or/of $x \in [-4,5; -3)$	✓✓ answer / antwoord (2)
	4.6.2	$p: y = 2^x$ $p^{-1}: x = 2^y$ $x = 2$ $0 < x < 2$ or / of $x \in (0; 2)$	✓ $x = 2$ ✓ answer / antwoord (3)
			[15]

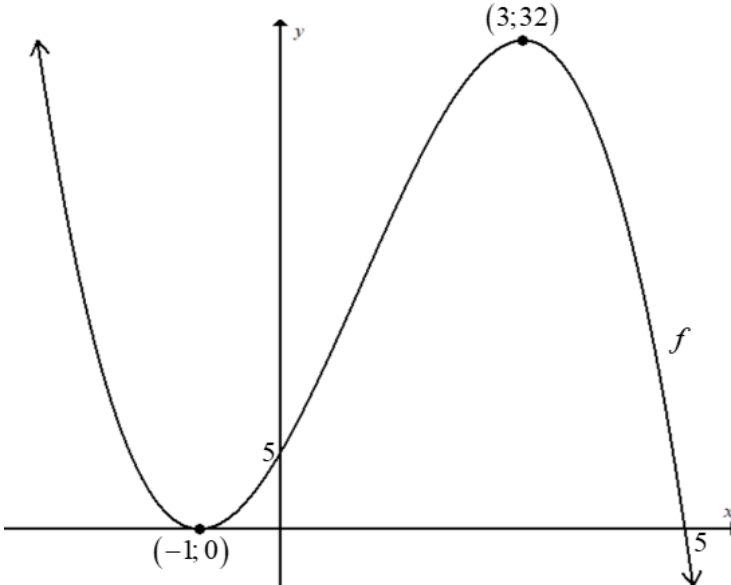
QUESTION/VRAAG 5			
5.1	5.1.1	$x = \frac{1}{2}$	✓ answer / <i>antwoord</i> (1)
	5.1.2	$-6x + 12 = \frac{6}{x}$ $-6x^2 + 12x - 6 = 0$ $x^2 - 2x + 1 = 0$ $(x-1)(x-1) = 0$ $x = 1$ $y = -6 + 12 = 6$ or/of $y = \frac{6}{1} = 6$ $A(1;6)$ $y = a(x+2)(x-3)$ $6 = a(1+2)(1-3)$ $6 = -6a$ $a = -1$ $f(x) = -(x+2)(x-3)$ $= -(x^2 - 3x + 2x - 6)$ $= -x^2 + x + 6$	✓ $\frac{6}{x} = -6x + 12$ ✓ value of x / <i>waarde van x</i> ✓ coordinates of A or value of y / <i>koördinate van A of waarde van y</i> ✓ $y = a(x+2)(x-3)$ ✓ value of a / <i>waarde van a</i> ✓ equation of f / <i>vergelijking van f</i> (6)
	5.1.3	$f\left(\frac{1}{2}\right) = -\left(\frac{1}{2}\right)^2 + \frac{1}{2} + 6$ $= 6,25$	✓✓ answer / <i>antwoord</i> (2)
	5.1.4	$f(x) = -\left(x - \frac{1}{2}\right)^2 + \frac{25}{4}$ $-\frac{1}{2} + m = -\frac{1}{4}$ $m = \frac{1}{4}$ $\frac{25}{4} + n = \frac{29}{4}$ $n = 1$	✓ value of n / <i>waarde van n</i> ✓ value of m / <i>waarde van m</i> (2)
	5.1.5 (a)	$k > 12$	✓✓ answer / <i>antwoord</i> (2)
	5.1.5 (b)	$k < \frac{25}{4}$	✓✓ answer / <i>antwoord</i> (2)

5.2	$p(x) = ax^2 + bx + c$ $p(-2) = a(-2)^2 + b(-2) - 4$ $-6 = 4a - 2b - 4$ $-2 = 4a - 2b \dots\dots\dots(1)$ $p(1) = a(1)^2 + b(1) - 4$ $0 = a + b - 4$ $4 = a + b \dots\dots\dots(2)$ $16 = 4a + 4b \dots\dots\dots(3)$ $(3) - (1):$ $18 = 6b$ $b = 3$ $a = 4 - 3$ $= 1$ $p(x) = x^2 + 3x - 4$ $p(10) = 126$	✓ equation 1 / vergelyking 1 ✓ equation 2 / vergelyking 2 ✓ value of b / waarde van b ✓ value of a / waarde van a ✓ answer / antwoord
		(5)
		[20]
QUESTION/VRAAG 6		
6.1	$A = P(1+i)^n$ $85\,000 = P\left(1 + \frac{12}{200}\right)^{32}$ $P = 85\,000\left(1 + \frac{12}{200}\right)^{-32}$ $P = 13\,171,38$	✓ substitution / vervanging ✓ $n = 32$ ✓ answer / antwoord
		(3)
6.2	$F_v = \frac{x[(1+i)^n - 1]}{i}$ $= \frac{55\,000 \left[\left(1 + \frac{6,75}{400}\right)^{16} - 1 \right]}{\frac{6,75}{400}}$ $= R\,1\,000\,646,90$ yes, R1 000 646,90 is greater than R1 million ja, R1 000 646,90 is groter as R1 miljoen	✓ $i = \frac{6,75\%}{4}$ and/en $n = 16$ ✓ substitution / vervanging ✓ F_v ✓ conclusion / gevolgtrekking
		(4)

6.3	6.3.1	$P_v = \frac{x[1-(1+i)^{-n}]}{i}$ $750\,000\left(1+\frac{11,5\%}{12}\right)^5 = \frac{x\left[1-\left(1+\frac{11,5\%}{12}\right)^{-235}\right]}{\frac{11,5\%}{12}}$ $\therefore x = \frac{750\,000\left(1+\frac{11,5\%}{12}\right)^5\left(\frac{11,5\%}{12}\right)}{\left[1-\left(1+\frac{11,5\%}{12}\right)^{-235}\right]}$ $= R8435,36$	✓ $n = -235$ ✓ $750\,000\left(1+\frac{11,5\%}{12}\right)^5$ ✓ substitution / <i>vervanging</i> ✓ answer / <i>antwoord</i> (4)
	6.3.2	$Total_1 = R\,8\,435,36 \times 235$ $= R1982\,309,60$ $Total_2 = R\,7\,998,22 \times 240$ $= R1919\,572,80$ Excess amount due to deferred payment : <i>Oortollige bedrag as gevolg van uitgestelde bedrag :</i> $= R1982\,309,22 - R1919\,572,80$ $= R\,62\,736,80$	✓ R1 982 309,60 & R1 919 572,60 ✓ answer / <i>antwoord</i> (2)
			[13]

QUESTION/VRAAG 7			
7.1	7.1.1	$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{3(x+h)^2 - 1 - (3x^2 - 1)}{h}$ $= \lim_{h \rightarrow 0} \frac{3(x^2 + 2xh + h^2) - 1 - 3x^2 + 1}{h}$ $= \lim_{h \rightarrow 0} \frac{3x^2 + 6xh + 3h^2 - 1 - 3x^2 + 1}{h}$ $= \lim_{h \rightarrow 0} \frac{6xh + 3h^2}{h}$ $= \lim_{h \rightarrow 0} \frac{h(6x + 3h)}{h}$ $= \lim_{h \rightarrow 0} (6x + 3h)$ $= 6x$	Penalise 1 mark for incorrect notation in this question <i>Penaliseer 1 punt vir verkeerde notasie in hierdie vraag</i> Answer ONLY: 0 marks <i>SLEGS antwoord: 0 punte</i> ✓ $3x^2 + 6xh + 3h^2$ ✓ simplification / vereenvoudiging ✓ factorisation / faktorisering (dividing by h / deel deur h) ✓ answer / antwoord
	7.1.2	$m_t = f'(1) = 6$ $y = 6x + c$ $2 = 6(1) + c$ $c = -4$ $y = 6x - 4$	✓ $f'(1) = 6$ ✓ substitution / vervanging ✓ answer / antwoord
7.2	7.2.1	$\frac{d}{dx}(x^2 + 5x)$ $= 2x + 5$	✓ $2x$ ✓ 5
	7.2.2	$\frac{y}{(1-\sqrt{x})} = \frac{2}{x}$ $y = \frac{2(1-\sqrt{x})}{x}$ $= \frac{2 - 2\sqrt{x}}{x}$ $= \frac{2}{x} - \frac{2\sqrt{x}}{x}$ $= 2x^{-1} - 2x^{-\frac{1}{2}}$ $\therefore \frac{dy}{dx} = -2x^{-2} + x^{-\frac{3}{2}}$	✓ $\frac{2}{x} - \frac{2\sqrt{x}}{x}$ ✓ $2x^{-1} - 2x^{-\frac{1}{2}}$ ✓ $-2x^{-2}$ ✓ $x^{-\frac{3}{2}}$
			[13]

QUESTION 8/VRAAG 8

8.1	8.1.1	$f(x) = -x^3 + 3x^2 + 9x + 5$ $x - \text{int}, y = 0 :$ $(x+1)(x+1)(x-5) = 0$ $x = -1 \text{ or/of } x = 5$ $(-1;0) \quad (5;0)$	✓ first factor / eerste faktor ✓ other factor / ander faktor ✓ x-intercepts / x-afsnitte (3)
	8.1.2	$f(x) = -x^3 + 3x^2 + 9x + 5$ $f'(x) = -3x^2 + 6x + 9$ $f'(x) = 0$ $-3x^2 + 6x + 9 = 0$ $x^2 - 2x - 3 = 0$ $(x-3)(x+1) = 0$ $x = 3 \text{ or / of } x = -1$ $f(3) = 32$ $f(-1) = 0$ $(3;32) \quad (-1;0)$	✓ $f'(x)$ ✓ $f'(x) = 0$ ✓ x-values / x-waardes ✓ y-values / y-waardes (4)
	8.1.3		✓ shape / vorm ✓ intercepts / afsnitte ✓ turning points / draaipunte (3)
8.2	8.2.1	$3x^2 + 6x = 0$ $x(3x + 6) = 0$ $x = 0 \text{ or / of } x = -2$ $-2 < x < 0 \text{ OR / OF } x \in (-2 ; 0)$	✓ $x = -2$ ✓ answer / antwoord (2)

	8.2.2	$x = \frac{-2+0}{2}$ $x = -1$ OR / OF $6x + 6 = 0$ $6x = -6$ $x = -1$	✓ method / <i>metode</i> ✓ answer / <i>antwoord</i> (2)
	8.2.3	$-2 \leq x \leq -1$ or / of $x \geq 0$	✓✓ $-2 \leq x \leq -1$ ✓ $x \geq 0$ (3)
[17]			
QUESTION/VRAAG 9			
		$8x + 4h = 3$ $4h = 3 - 8x$ $h = \frac{3}{4} - 2x$ $V = x^2 h$ $= x^2 \left(\frac{3}{4} - 2x \right)$ $= \frac{3}{4} x^2 - 2x^3$ $V'(x) = \frac{3}{2} x - 6x^2 = 0$ $x \left(\frac{3}{2} - 6x \right) = 0$ $x = 0 \text{ or / of } -6x = -\frac{3}{2}$ $x = \frac{1}{4}$ $\therefore h = \frac{3}{4} - 2 \left(\frac{1}{4} \right) = \frac{1}{4}$	✓ $8x + 4h = 3$ ✓ h in terms of x / h in <i>terme van x</i> ✓ substitution / <i>vervanging</i> ✓ answer / <i>antwoord</i> ✓ $V'(x) = 0$ ✓ x -values / <i>x-waardes</i> ✓ value of h / <i>waarde van h</i> (7)
[7]			

QUESTION 10/VRAAG 10			
10.1	10.1.1	$P(A \text{ and/en } B) = P(A) + P(B) - P(A \text{ or/of } B)$ $= 0,3 + 0,5 - 0,65$ $= 0,15$	✓ substitution / <i>vervanging</i> ✓ answer / <i>antwoord</i> (2)
	10.1.2	$P(A \text{ and/en } B) = 0,15$ $P(A) \times P(B) = 0,3 \times 0,5$ $= 0,15$ $\therefore P(A \text{ and/en } B) = P(A) \times P(B) = 0,15$ $\therefore$ Events are independent / <i>Gebeurtenisse is onafhanklik</i>	✓✓ $P(A) \times P(B) = 0,15$ ✓ conclusion / <i>gevolgtrekking</i> (3)
10.2	10.2.1	$a = 35$ and/en $b = 15$	✓ a ✓ b (2)
	10.2.2	$\frac{11}{45}$ $\approx 0,24$	✓✓ answer / <i>antwoord</i> (2)
			[9]
QUESTION/VRAAG 11			
11.1	$4! \times 8!$ ways / <i>maniere</i> = 967 680 ways / <i>maniere</i>		✓✓ answer / <i>antwoord</i> (2)
11.2	$P(E) = \frac{4! \times 3!}{12!}$ $= \frac{1}{3326400}$		✓ $4! \times 3!$ ✓ $12!$ ✓ answer / <i>antwoord</i> (3)
			[5]
	TOTAL/TOTAAL:		150



education

Department of
Education
FREE STATE PROVINCE

**PREPARATORY EXAMINATION/
VOORBEREIDENDE EKSAMEN**

GRADE/GRAAD 12

MATHEMATICS P1/WISKUNDE V1

SEPTEMBER 2026

MARKS/PUNTE: 150

MARKING GUIDELINES/NASIENRIGLYNE

**These marking guidelines consist of 17 pages./
Hierdie nasienriglyne bestaan uit 17 bladsye.**

NOTE:

- If a candidate answers a question TWICE, only mark the FIRST attempt.
- If a candidate has crossed out an attempt at a question and not redone the question, mark the crossed-out version.
- Consistent accuracy applies in ALL aspects of the marking memorandum. Stop marking the second calculation error.
- Assuming answers/values in order to solve a problem is NOT acceptable.

NOTA:

- *As 'n kandidaat 'n vraag TWEE KEER beantwoord, merk slegs die EERSTE poging.*
- *As 'n kandidaat 'n antwoord van 'n vraag doodtrek en nie oordoen nie, merk die doodgetrekte poging.*
- *Volgehoue akkuraatheid word in ALLE aspekte van die nasienriglyne toegepas. Hou op nasien by die tweede berekeningsfout.*
- *Aanvaar van antwoorde/waardes om 'n probleem op te los, word NIE toegelaat nie.*

QUESTION/VRAAG 1

1.1.1	$(x+2)(x-2) = 5$ $\therefore x^2 - 4 = 5$ $\therefore x^2 = 9$ $\therefore x = \pm 3$	$\checkmark x^2 - 4$ $\checkmark$ Answer (2)
1.1.2	$\frac{1}{2}x^2 - 2x - 1 = 0$ Method 1 $\frac{1}{2}x^2 - 2x - 1 = 0$ $x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4\left(\frac{1}{2}\right)(-1)}}{2\left(\frac{1}{2}\right)} = 2 \pm \sqrt{6}$ $\therefore x = 4,45 \text{ or } x = -0,45$ Method 2 $\frac{1}{2}x^2 - 2x - 1 = 0$ $\therefore x^2 - 4x - 2 = 0$ $x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(1)(-2)}}{2(1)} = \frac{4 \pm \sqrt{24}}{2}$ $\therefore x = 4,45 \text{ or } x = -0,45$	$\checkmark$ substitution into the correct formula $\checkmark$ Answer $\checkmark$ Answer (3) $\checkmark$ substitution into the correct formula $\checkmark$ Answer $\checkmark$ Answer (3)

1.1.3	$5 < x(7 - 2x)$ $2x^2 - 7x + 5 < 0$ $(2x - 5)(x - 1) < 0$ C/V: 1 & $\frac{5}{2}$ $1 < x < \frac{5}{2}$ But since $x > 2$ $\therefore 2 < x < \frac{5}{2}$	✓ Standard form ✓ Factors ✓ C/V ✓ interval for x values ✓ Conclusion (5)
1.1.4	$3^x - 1 = \sqrt{2 \cdot 3^{x+1} + 10}$ $(3^x - 1)^2 = 2 \cdot 3^{x+1} + 10$ $3^{2x} - 2 \cdot 3^x + 1 - 2 \cdot 3^x \cdot 3^1 - 10 = 0$ $3^{2x} - 8 \cdot 3^x - 9 = 0$ $(3^x - 9)(3^x + 1) = 0$ $3^x = 9$ or $3^x = -1$ $\therefore 3^x = 3^2$ $\therefore x = 2$	✓ squaring both sides ✓ standard form ✓ factors ✓ answer (4)
1.2.1	For real and equal roots $\Delta = 0$ $\therefore p^2 - 2p + 1 = 0$ $(p - 1)(p - 1) = 0$ $\therefore p = 1$	✓ $p^2 - 2p + 1 = 0$ ✓ $p = 1$ (2)
1.2.2	$x = 2 \pm \sqrt{1^2 - 2(1) + 1}$ $\therefore x = 2$ $\therefore (x - 2)(x - 2) = 0$ $\therefore x^2 - 4x + 4 = 0$ $\therefore b = -4$ $\therefore c = 4$	✓ $x = 2$ ✓ $(x - 2)(x - 2) = 0$ ✓ $b = -4$ both values $c = 4$ (3)

1.3	$\frac{2^{2y}}{2^x} = 2^{-1}$ $2^{2y-x} = 2^{-1}$ $\therefore x = 2y + 1$ $x^2 + y^2 = 29$ $(2y + 1)^2 + y^2 - 29 = 0$ $5y^2 + 4y - 28 = 0$ $(y - 2)(5y + 14) = 0$ $\therefore y = 2 \text{ or } y = -\frac{14}{5}$ $x = 5 \text{ or } x = -\frac{23}{5}$	$\checkmark 2^{2y-x} = 2^{-1}$ $\checkmark x = 2y + 1$ $\checkmark \text{substitution}$ $\checkmark \text{standard form}$ $\checkmark \text{factors}$ $\checkmark y \text{ values}$ $\checkmark x \text{ values}$
		(7)
		[26]

QUESTION/VRAAG 2

2.1.1	$2a = 4$ $\therefore a = 2$ $3a + b = 9$ $3(2) + b = 9$ $\therefore b = 3$ $a + b + c = 9$ $2 + 3 + c = 9$ $\therefore c = 4$ $\therefore T_n = 2n^2 + 3n + 4$	✓ $a = 2$ ✓ $b = 3$ ✓ $c = 4$ ✓ $T_n = 2n^2 + 3n + 4$ (4)
2.1.2	$2n^2 + 3n + 4 = 864$ $2n^2 + 3n - 860 = 0$ $(n - 20)(2n + 43) = 0$ $\therefore n = 20$	✓ $2n^2 + 3n + 4 = 864$ ✓ $(n - 20)(2n + 43) = 0$ ✓ $n = 20$ (3)
2.2	$T_3 - T_2 = 10$ $T_3 - 14 = 10$ $\therefore T_3 = 24$ $T_4 = 7p$ $\therefore 10 - 14 + p = 7p - 24 - 10$ $-6p = -30$ $\therefore p = 5$	✓ $T_3 - 14 = 10$ ✓ $T_3 = 24$ ✓ $10 - 14 + p = 7p - 24 - 10$ ✓ $p = 5$ (4)
		[11]

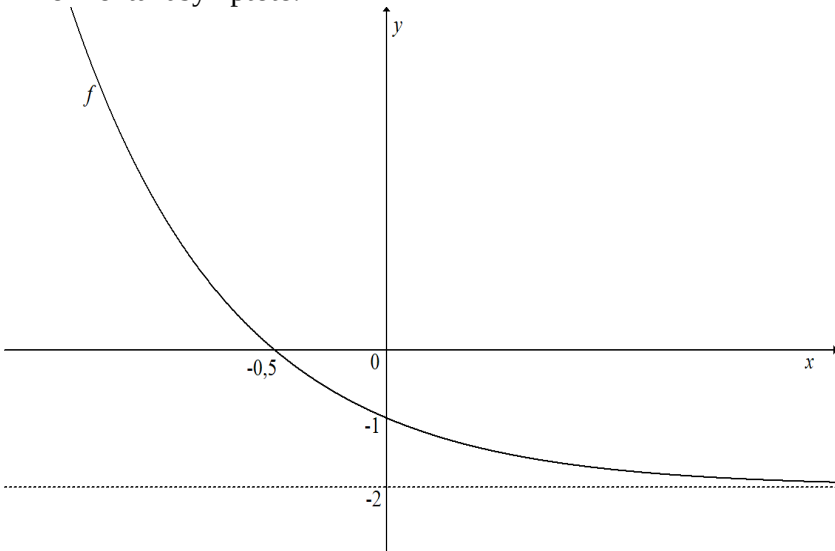
QUESTION/VRAAG 3

3.1.1	$T_4 = 55$ $T_{10} = 45$ $a + 3d = 55$ $\underline{a + 9d = 45}$ $-6d = 10$ $\therefore d = -\frac{5}{3}$ $\therefore a + 3\left(-\frac{5}{3}\right) = 55$ $\therefore a = 60$	✓ Setting up the two equations ✓ $d = -\frac{5}{3}$ ✓ $a = 60$ (3)
3.1.2	$60; \frac{175}{3}; \frac{170}{3}; \dots; 0; -\frac{5}{3}; \dots$ $0 = 60 + (n-1)\left(-\frac{5}{3}\right)$ $\therefore n = 37$ $\therefore S_n = \frac{n}{2}[a + l]$ $S_{37} = \frac{37}{2}[60 + 0]$ $= 1110$	✓ Setting up the sequence/series ✓ The value of n ✓ Substitution into the correct sum formula ✓ Answer (4)
3.2	$a; b; \dots$ $r = \frac{b}{a}$ $\therefore T_3 = b \times \frac{b}{a}$ $\therefore T_3 = \frac{b^2}{a}$	✓ $T_3 = \frac{b^2}{a}$ (1)

3.3.1	$\sum 3.n^{1-r} = 3 + \frac{3}{n} + \frac{3}{n^2} + \dots = 6$ $S_{\infty} = \frac{a}{1-r}$ $6 = \frac{3}{1-\frac{1}{n}}$ $6 - \frac{6}{n} = 3$ $3n = 6$ $\therefore n = 2$	✓Expansion ✓Substitution into the correct formula ✓Answer (3)
3.3.2	$S_n = \frac{a(r^n - 1)}{r - 1}$ $S_{10} = \frac{3 \left[\left(\frac{1}{2} \right)^{10} - 1 \right]}{\frac{1}{2} - 1}$ $= 5,99$	✓Substitution into the correct formula ✓Answer (2)
		[13]

QUESTION/VRAAG 4

4.1.1	$f'(x) = 2x - 14$ $f'(8) = 2$ $f(8) = -5$ $y = 2x + c$ subst $(8; -5)$ $-5 = 2(8) + c$ $\therefore c = -21$ $\therefore y = 2x - 21$ or $y + 5 = 2(x - 8)$ $y + 5 = 2x - 16$ $\therefore y = 2x - 21$	$\checkmark 2x - 14$ $\checkmark$ gradient at $x = 8$ $\checkmark$ y value $\checkmark$ substitution $\checkmark$ answer (5)
4.1.2	$g'(x) = -2x + 10$ $-2x + 10 = 2$ $\therefore x = 4$ $y = 2(4) - 21$ $= -13$ $\therefore B(4; -13)$ $g(x) = -x^2 + 10x - 19 + k$ subst $B(4; -13)$ $-13 = -(4)^2 + 10(4) - 19 + k$ $k = -18$	$\checkmark -2x + 10 = 2$ $\checkmark$ the value of x $\checkmark B(4; -13)$ $\checkmark$ substitution of $B(4; -13)$ $\checkmark$ value of k (5)

4.2.1	$f(x) = 4^{-x} - 2$ y- intercept: $y = 4^{-(0)} - 2 = -1$ x- intercept: $0 = 4^{-x} - 2$ $\therefore 2 = 2^{-2x}$ $\therefore 1 = -2x$ $\therefore x = -\frac{1}{2}$ $y = -2$ Horizontal asymptote: 	✓ Shape ✓ x-intercept on the graph ✓ y-intercept on the graph ✓ asymptote (4)
4.2.2	$\frac{1}{2}$ units to the right and 2 units upwards.	✓✓ $\frac{1}{2}$ units to the right ✓ 2 units upwards (3)
4.2.3	$h(x) = \left(\frac{1}{4}\right)^x$ $x = \left(\frac{1}{4}\right)^y$ $y = \log_{\left(\frac{1}{4}\right)}(x)$ $h^{-1}(x) = \log_{\left(\frac{1}{4}\right)}(x)$	✓ Swop x and y ✓ answer (2)
4.2.4	$y > -2$	✓✓ $y > -2$ (2)
		[21]

QUESTION/VRAAG 5

5.1	$g(x) = \frac{a}{x+1} + 1$ Substitute the point $(-2; 2)$: $2 = \frac{a}{-2+1} + 1$ $\therefore 1 = \frac{a}{-1}$ $\therefore a = -1$ $y = \frac{-1}{x+1} + 1$ $\therefore p = 1, q = 1, a = -1$ $y = dx^2$ Substitute the point $(-2; 2)$: $2 = d(-2)^2$ $\therefore d = \frac{1}{2}$ $\therefore y = \frac{1}{2}x^2$	✓ $a = -1$ ✓ $p = 1$ ✓ $q = 1$ ✓ $d = \frac{1}{2}$ (4)
5.2	$\frac{1}{2}x^2 = \frac{-1}{x+1} + 1$ $\frac{1}{2}x^2(x+1) = -1 + x + 1$ $x^3 + x^2 - 2x = 0$ $x(x^2 + x - 2) = 0$ $x(x+2)(x-1) = 0$ $\therefore x = 0 \text{ or } x = -2 \text{ or } x = 1$ $\therefore y = \frac{1}{2}(1) = \frac{1}{2}$ $\therefore Q\left(1; \frac{1}{2}\right)$	✓ $\frac{1}{2}x^2 = \frac{-1}{x+1} + 1$ ✓ Standard form ✓ Factors ✓ Values of x ✓ Coordinates of Q (5)
5.3	$BC = \frac{1}{2}x^2 - \left(-\frac{1}{x+1} + 1\right)$ $= \frac{1}{2}(4)^2 + \frac{1}{4+1} - 1$ $= 7.2 \text{ units}$	✓ The difference between the two functions ✓ Substituting the value 4 ✓ Answer (3)
		[12]

QUESTION/VRAAG 6

6.1	$100000 = 230000(1 - 0,07)^n$ $n = \log_{0,93} 0,4347826087$ $n = 11,47721057$ It will take approximately 11 years 6 months to depreciate to R100 000	✓ Substitution into the correct formula ✓ use of log ✓ answer (3)
6.2.1	$350000 = \frac{x \left[\left(1 + \frac{0,14}{12} \right)^{97} - 1 \right]}{\frac{0,14}{12}}$ $x = R1962.60$	✓ $n = 97$ ✓ $i = \frac{0,14}{12}$ ✓ subst ✓ answer (4)
6.2.2	$A = 350000 + 15000 \left(1 + \frac{0,14}{12} \right)^{84} - 20000 \left(1 + \frac{0,14}{12} \right)^{72}$ $A = R343638,14$ $shortfall = 350000 - 343638,14$ $= R6361,86$	✓ $15000 \left(1 + \frac{0,14}{12} \right)^{84}$ ✓ $20000 \left(1 + \frac{0,14}{12} \right)^{72}$ ✓ R343 638,14 ✓ R6 361,86 (4)
6.3	decrease $P_x \times (1 - 0,08)^3$ increase $P_y \times (1 + 0,12)^3$ $\frac{P_x}{P_y} = \frac{(1 - 0,08)^3}{(1 + 0,12)^3}$ $\frac{P_x}{P_y} = \frac{0,554254736}{1}$	✓ $P_x \times (1 - 0,08)^3$ ✓ $P_y \times (1 + 0,12)^3$ ✓ $\frac{P_x}{P_y} = \frac{(1 - 0,08)^3}{(1 + 0,12)^3}$ ✓ $\frac{0,554254736}{1}$ (4)
		[15]

QUESTION/VRAAG 7

7.1	$f(x) = -x^2 - 3$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{-(x+h)^2 - 3 - (-x^2 - 3)}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{-x^2 - 2xh - h^2 - 3 + x^2 + 3}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{-2xh - h^2}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{h(-2x - h)}{h}$ $f'(x) = \lim_{h \rightarrow 0} (-2x - h)$ $f'(x) = -2x$	✓ Substitution ✓ Simplification ✓ Factors ✓ answer (4)
7.2.1	$D_x \left[\frac{8x^2 - 14x - 15}{4x + 3} \right]$ $= D_x \left[\frac{(4x + 3)(2x - 5)}{4x + 3} \right]$ $= D_x [2x - 5]$ $= 2$	✓ Factors ✓ Simplification ✓ answer (3)
7.2.2	$\frac{\sqrt[4]{x^{-5}}}{x^{-3}} - \frac{\sqrt[3]{x^2}}{2x^2} + 3x^2$ $= \frac{x^{\frac{-5}{4}}}{x^{-3}} - \frac{x^{\frac{2}{3}}}{2x^2} + 3x^2$ $= x^{\frac{7}{4}} - \frac{1}{2}x^{\frac{-4}{3}} + 3x^2$ $= \frac{7}{4}x^{\frac{3}{4}} + \frac{2}{3}x^{\frac{-7}{4}} + 6x$	✓ $x^{\frac{-5}{4}}$ ✓ $x^{\frac{2}{3}}$ ✓ $x^{\frac{7}{4}}$ ✓ $-\frac{1}{2}x^{\frac{-4}{3}}$ ✓ First two ✓ The last one (6)

7.3	$f'(x) = -9x^2 - 4$ $f'(-1) = -9(-1)^2 - 4$ $\therefore m = -13$ $f(-1) = -3(-1)^3 - 4(-1) + 5$ $= 12$ $(-1; 12)$ $y - y_1 = m(x - x_1)$ $y - 12 = -13(x + 1)$ $y = -13x - 1$	✓ Gradient ✓ y value ✓ Substitution ✓ answer (4)
		[17]

QUESTION/VRAAG 8

8.1	$f(x) = a(x - x_1)(x - x_2)(x - x_3)$ $f(x) = a(x + 2)(x - 1)(x - 4)$ $10 = a(2 + 2)(2 - 1)(2 - 4)$ $\therefore -8a = 10$ $\therefore a = \frac{-5}{4}$ $f(x) = -\frac{5}{4}(x + 2)(x^2 - 5x + 4)$ $f(x) = -\frac{5}{4}(x^3 - 3x^2 - 6x + 8)$ $f(x) = -\frac{5}{4}x^3 + \frac{15}{4}x^2 + \frac{15}{2}x - 10$	✓ Substitution of x-intercepts and the point (2 ; 10) ✓ The value of a ✓ Substituting a in the formula ✓ answer (4)
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8.2	$f(x) = -\frac{5}{4}x^3 + \frac{15}{4}x^2 + \frac{15}{2}x - 10$ $f'(x) = -\frac{15}{4}x^2 + \frac{30}{4}x + \frac{15}{2}$ $0 = -15x^2 + 30x + 30$ $x^2 - 2x - 2 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{2 \pm \sqrt{12}}{2}$ $x = -0.73$ $x = 2.73$ $(2,73; 13,02)$ $(-0,73; -12,99)$	✓Equating the derivative to zero ✓Subst. into the quadratic formula ✓Values of x ✓Values of y (4)
8.3		✓shape ✓x-intercepts ✓y-intercept ✓turning points (4)
		[12]

QUESTION/VRAAG 9

9.1	A maximum turning point is the value of y where the graph of the function changes from increasing to decreasing, and the profit is at its highest.	(1)
9.2	$-4x + 160 = 0$ $x = 40$	✓ Derivative equated to zero ✓ The value of x (2)
9.3	$p(40) = -2(40)^2 + 160(40) - 2000$ $p(40) = R1200$	✓ Substitution ✓ Answer (2)
9.4	$p(60) = -2(60)^2 + 160(60) - 2000$ $p(60) = R400$ The company should not operate at full capacity, but rather produce 40 units for maximum profit	✓ Substitution ✓ Answer ✓ Conclusion (3)
		[8]

QUESTION/VRAAG 10

10.1.1	$P(\text{not } A) = 1 - 0,35 = 0,65$	✓ Substitution ✓ Answer (2)
10.1.2	$P(A \text{ and } B) = 0$	✓ Answer (1)
10.1.3	$P(A \text{ or } B) = 0,35 + 0,52 - 0 = 0,87$	✓ Substitution ✓ Answer (2)
10.2.1		✓ Event A ✓ Event B: Male ✓ Event B: Female (3)
10.2.2	$P(F) = \left(\frac{2}{3} \times \frac{1}{2}\right) + \left(\frac{2}{3} \times \frac{1}{2}\right)$ $= \frac{2}{3}$	✓ Answer (1)
10.2.3	$P(\text{Male flipping Head}) = \frac{1}{3} \times \frac{1}{2} = \frac{1}{6}$	✓ Substitution ✓ Answer (2)
10.3	Two letters and one digit: $5 \times 5 \times 10 = 250$ Two letters and two digits: $5 \times 5 \times 10 \times 9 = 2\,250$ Two letters and three digits: $5 \times 5 \times 10 \times 9 \times 8 = 18\,000$ Two letters and four digits: $5 \times 5 \times 10 \times 9 \times 8 \times 7 = 126\,000$ $\therefore$ Codes of two letters and four digits will ensure unique codes for 120 000 members	✓ First and second statements ✓ Third statement ✓ Fourth statement ✓ conclusion (4)
		[15]

TOTAL/TOTAAL: 150



PREPARATORY EXAMINATION

2026

MARKING GUIDELINES

MATHEMATICS PAPER 1 (10611)

22 pages

NOTES:

- If a candidate answered a question TWICE, mark only the *FIRST* attempt.
- If a candidate crossed OUT an answer and did not redo it, mark the crossed-out answer.
- Consistent accuracy (CA) applies to ALL aspects of the marking guidelines.
- It is UNACCEPTABLE for candidates to assume values/answers in order to solve a question.
- (A) – denotes an accuracy mark.

QUESTION 1

1.1.1	$3x^2 - x + 2 = x + 2$ $3x^2 - 2x = 0$ $x(3x - 2) = 0$ $x = 0$ or $x = \frac{2}{3}$	✓ standard form ✓ factors ✓ both answers	(3)
1.1.2	$7x^2 - x - 2 = 0$ $x = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(7)(-2)}}{2(7)}$ $x = 0,61$ or $x = -0,47$ NOTE: Penalise one mark for incorrect rounding in this question.	✓ correct substitution ✓ answer ✓ answer	(3)
1.1.3	$\left(\frac{x}{2}\right)^2 - 5x + 24 \leq 0$ $\frac{x^2}{4} - 5x \leq -24$ $x^2 - 20x + 96 \leq 0$ $(x - 8)(x - 12) \leq 0$ CVs = 8 ; 12 $8 \leq x \leq 12$ 	✓ squaring fraction ✓ standard form ✓ critical values ✓✓ answer (combo mark)	(5)
1.1.4	$2^{-x+2} - 2^{-x} = 48$ $2^{-x}(2^2 - 1) = 48$ $2^{-x} = 16$ $2^{-x} = 2^4$ $x = -4$ OR let $2^{-x} = k$ $\therefore 4k - k = 48$ $3k = 48$ $k = 16$ $\therefore 2^{-x} = 16$ $2^{-x} = 2^4$ $x = -4$	✓ factorise HCF ✓ simplify (equate = bases) ✓ answer for x ✓ setting up eqn with k ✓ simplify (equate = bases) ✓ answer for x	(3)

	$b = -5$ $-4ac = 56a$ $c = -14$ $\frac{5 + \sqrt{25 + 56a}}{2a} = 7$ $5 + \sqrt{25 + 56a} = 14a$ $\sqrt{25 + 56a} = 14a - 5$ $25 + 56a = 196a^2 - 140a + 25$ $196a^2 - 196a = 0$ $196a(a - 1) = 0$ $a \neq 0 \text{ or } a = 1$ OR $ax^2 + bx + c = 0$ $49a + 7b + c = 0 \dots (1)$ $x = \frac{5 - \sqrt{25 + 56a}}{2a}$ $-b = 5$ $b = -5$ $b^2 - 4ac = 25 + 56a$ $(5)^2 - 4ac = 25 + 56a$ $-4ac = 56a$ $c = -14$ from (1) $49a - 49 = 0$ $a = 1$ OR $b = -5$ $-4ac = 56a$ $c = -14$ $0 = a(7)^2 - 5(7) - 14$ $49a - 35 - 14 = 0$ $\therefore a = 1$	$\checkmark \quad b = -5$ $\checkmark \quad \text{setting up equation}$ $\checkmark \quad \text{value for } c$ $\checkmark \quad \text{substitution}$ $\checkmark \quad \text{value for } a$ $\checkmark \quad \text{setting up equation}$ $\checkmark \quad \text{value for } b$ $\checkmark \quad \text{substitution}$ $\checkmark \quad \text{value for } c$ $\checkmark \quad \text{value for } a$ $\checkmark \quad b = -5$ $\checkmark \quad \text{setting up equation}$ $\checkmark \quad \text{value for } c$ $\checkmark \quad \text{substitution}$ $\checkmark \quad \text{value for } a$	
			(5)
1.3.2	$x = -2$	$\checkmark \quad \text{answer}$	(1)
[26]			

QUESTION 2

2.1	$7 \sin 30^\circ ; 7 ; 23 \sin 30^\circ ; 17 \dots$ $\frac{7}{2} ; 7 ; \frac{23}{2} ; 17$ $\frac{7}{2} \quad \frac{9}{2} \quad \frac{11}{2}$ $1 \quad 1$ $2^{\text{nd}} \text{ Difference} = 1$ $\therefore$ the pattern is quadratic	✓ sequence ✓ first differences ✓ 2 nd differences	(3)
2.2	$3a + b = \frac{7}{2}$ $3\left(\frac{1}{2}\right) + b = \frac{7}{2}$ $b = 2$ $\therefore p = 2$ $a + b + c = \frac{7}{2}$ $\frac{1}{2} + 2 + c = \frac{7}{2}$ $c = 1$ $\therefore q = 1$ NOTE: Award FULL marks if left in terms of b and c. Answer only, award ZERO marks.	✓ substitution ✓ substitution	(2)
2.3	$49 = \frac{1}{2}n^2 + 2n + 1$ $0 = n^2 + 4n - 96$ $0 = (n + 12)(n - 8)$ $n \neq -12 \text{ or } n = 8$	✓ equate to 49 ✓ standard form ✓ factors ✓ both answers with rejection.	(4)

2.4	$x = \frac{-2}{2\left(\frac{1}{2}\right)}$ $x = -2$ The minimum value of the function occurs where, $x = -2$, but $n \neq -2$ as $n \in N$. OR $y = \frac{1}{2}x^2 + 2x + 1$ $\frac{dy}{dx} = x + 2$ $0 = x + 2$ $x = -2$ The minimum value of the function occurs where, $x = -2$, but $n \neq -2$ as $n \in N$. OR A valid explanation as follows: The learner is incorrect because T_n represents a number pattern, and n can therefore only be positive integers. The turning point of the quadratic function gives the minimum value of the function for all real values of x, but not necessarily the minimum term of the pattern. Since the sequence increases from $n=1$, the minimum term of the pattern is: $T_1 = \frac{1}{2}(1)^2 + 2(1) + 1$ $T_1 = \frac{7}{2}$ The turning point of the function can therefore not be used to determine the minimum value of the pattern as it occurs at an impermissible value of n. NOTE: The explanation must be supported by a valid calculation of the turning point of the associated quadratic function or of the first term of the pattern. In the second option, the = 0 for the first mark may be implied.	$\checkmark$ $x = \frac{-b}{2a}$ calculation $\checkmark$ value for x $\checkmark$ valid explanation. $\checkmark$ derivative=0 $\checkmark$ value for x $\checkmark$ valid explanation. $\checkmark$ valid explanation $\checkmark$ calculation for T_1 $\checkmark$ valid explanation	(3)
[12]			

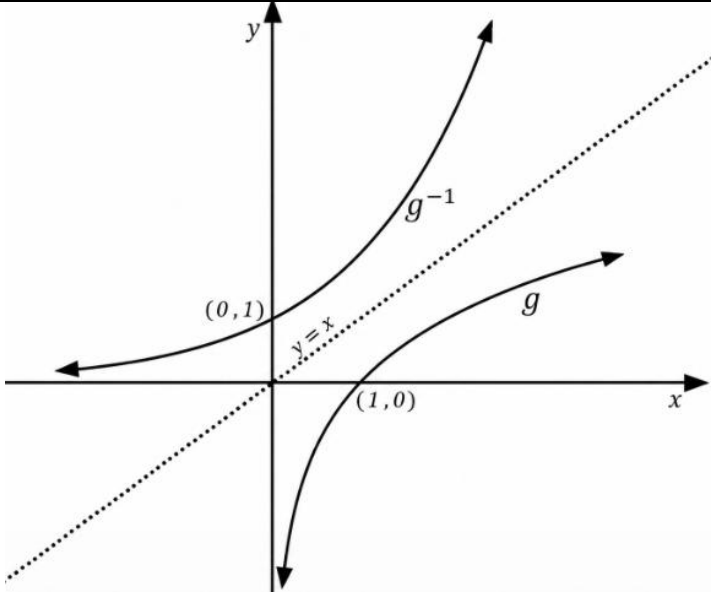
QUESTION 3

3.1.1	$r = \frac{2}{3}x ; x \neq 0$ $-1 < r < 1$ $-1 < \frac{2}{3}x < 1$ $\therefore -\frac{3}{2} < x < \frac{3}{2}$ NOTE: $x \neq 0$ may be implied.	✓ $r = \frac{2}{3}x$ ✓ answer	(2)
3.1.2	$3 + 1 + \frac{1}{3}$ $r = \frac{1}{3}$ $S_{\infty} = \frac{3}{1 - \frac{1}{3}}$ $S_{\infty} = \frac{9}{2}$ OR $S_{\infty} = \frac{3}{1 - \frac{2}{3}\left(\frac{1}{2}\right)}$ $S_{\infty} = \frac{9}{2}$	✓ value for r ✓ substitution ✓ answer ✓ ✓ substitution ✓ answer	(3)

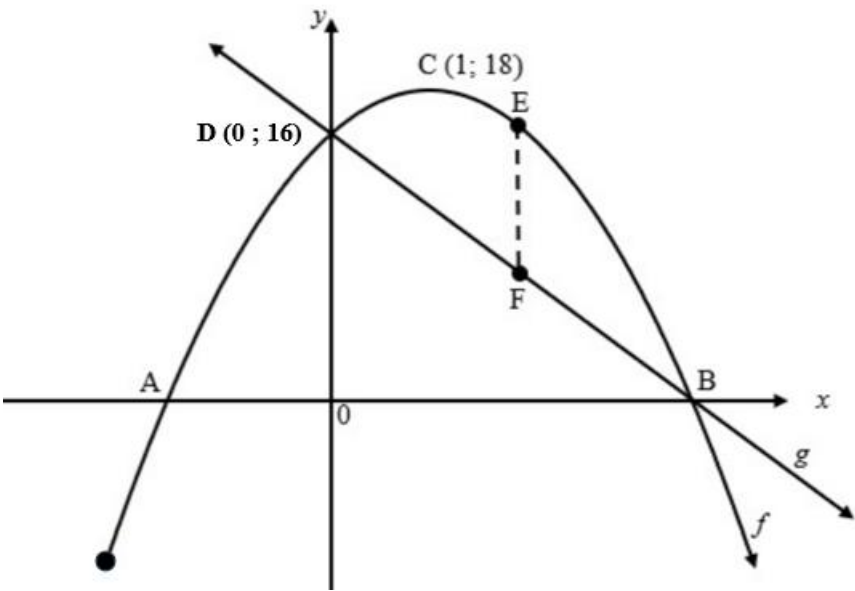
3.2.1	$B_n = \sum_{k=1}^n 24 \left(\frac{3}{2} \right)^k$ 36 ; 54 ; 81 $a = 36 \quad r = \frac{3}{2}$ $S_n = \frac{36 \left[\left(\frac{3}{2} \right)^n - 1 \right]}{\frac{3}{2} - 1}$ $S_n = 72 \left[\left(\frac{3}{2} \right)^n - 1 \right]$ NOTE: answer only, 0 marks	✓ values for a and r ✓ substitution	(2)
3.2.2	$A_{18} - B_n = \frac{423}{8}$ $A : -15 ; -8 ; -1$ $a = -15 \quad d = 7$ $S_{18} = \frac{18}{2} [2(-15) + (18-1)(7)]$ $S_{18} = 801$ $\therefore 801 - \left[72 \left(\frac{3}{2} \right)^n - 1 \right] = \frac{423}{8}$ $\left(\frac{3}{2} \right)^n = \frac{729}{64}$ $\left(\frac{3}{2} \right)^n = \left(\frac{3}{2} \right)^6$ $n = 6$	✓ values for a and d ✓ substitution ✓ answer ✓ substitution ✓ simplification ✓ answer	(6)
[13]			

QUESTION 4

4.1	$p = -2$ $q = 3$ NOTE: Answers may NOT be given in terms of x and y.	✓ value for p ✓ value for q	(2)
4.2	$y = x + t$ substitute in (2 ; 3) $3 = 2 + t$ $t = 1$ OR Axis of symmetry with + gradient $y = x - 2 + 3$ $y = x + 1$ $t = 1$ NOTE: Answer only, award FULL marks	✓ substitution into equation ✓ value for t ✓ substitution into equation ✓ value for t	(2)
4.3	$y = \frac{-2}{x-2} + 3$ $h(x) = \frac{-2}{x} + 6$ $\therefore x - 6 = \frac{-2}{y}$ $y = \frac{-2}{x-6}$	✓ $\frac{-2}{x}$ ✓ +6 ✓ equation of h	(3)

4.4.1	$g(x) = \log_2 x$ $y = \log_2 x$ $\therefore x = \log_2 y$ $\therefore y = 2^x$ NOTE: Answer only, award FULL marks.	✓ interchange of x and y ✓ answer	(2)
4.4.2		✓ increasing g with asymptote $x=0$ ✓ y-intercept of g^{-1} and x intercept of g ✓ increasing g^{-1} with asymptote $y=0$ ✓ any additional point on both graphs	(4)
4.4.3	$0 < x \leq 1$ OR $x \in (0;1]$	✓✓ answer (combination mark)	(2)
[15]			

QUESTION 5



5.1	$f(x) = a(x-1)^2 + 18$ $\therefore 16 = a(0-1)^2 + 18$ $16 = a + 18$ $a = -2$ $\therefore f(x) = -2(x-1)^2 + 18$ $\therefore f(x) = -2(x^2 - 2x + 1) + 18$ $\therefore f(x) = -2x^2 + 4x - 2 + 18$ $\therefore f(x) = -2x^2 + 4x + 16$	✓ subs (1;18) ✓ subs (0;16) ✓ value for a ✓ simplification of squaring binomial	(4)
5.2	$f(x) = -2x^2 + 4x + 16$ $0 = x^2 - 2x - 8$ $0 = (x+2)(x-4)$ $x = -2 \text{ or } x = 4$ $\therefore AB = 6 \text{ units}$	✓ $f(x) = 0$ ✓ answer	(2)

5.3	$m = \frac{16-0}{0-4}$ $m = -4$ $\therefore g(x) = -4x + 16$ OR $y = mx + 16$ $0 = 4m + 16$ $m = -4$ $\therefore g(x) = -4x + 16$	✓ gradient ✓ answer ✓ gradient ✓ answer	(2)
5.4.1	$-4 \leq x < 1$ OR $x \in [-4; 1)$ Accept $-4 \leq x \leq 1$ or $x \in [-4; 1]$	✓✓ answer	(2)
5.4.2	$1 < x < 4$ or $-4 \leq x < -2$ OR $x \in (1; 4)$ or $[-4; -2)$	✓ $1 < x < 4$ ✓ $-4 \leq x < -2$	(2)

5.5	$f(x) - g(x)$ $= -2x^2 + 4x + 16 - (-4x + 16)$ $= -2x^2 + 8x$ $\therefore EF_{MAX} \text{ Derivative} = 0$ $-4x + 8 = 0$ $4x = 8$ $x = 2$ $\therefore -2(2)^2 + 8(2)$ $= 8 \text{ units}$ OR $f(x) - g(x)$ $= -2x^2 + 4x + 16 - (-4x + 16)$ $= -2x^2 + 8x$ $x = \frac{-b}{2a} = \frac{-8}{2(-2)}$ $x = 2$ $\therefore -2(2)^2 + 8(2)$ $= 8 \text{ units}$ OR $f(x) - g(x)$ $= -2x^2 + 4x + 16 - (-4x + 16)$ $= -2x^2 + 8x$ $\therefore -2(x^2 - 4x + 2^2 - 2^2)$ $= -2(x - 2)^2 + 2(2)^2$ $= -2(x - 2)^2 + 8$ $\therefore 8 \text{ units}$	$\checkmark EF = f(x) - g(x)$ $\checkmark \text{ answer in terms of } x$ $\checkmark \text{ derivative} = 0$ $\checkmark \text{ value for } x$ $\checkmark \text{ answer}$ $\checkmark EF = f(x) - g(x)$ $\checkmark \text{ answer in terms of } x$ $\checkmark \text{ subs into } \frac{-b}{2a}$ $\checkmark \text{ value for } x$ $\checkmark \text{ answer}$ $\checkmark EF = f(x) - g(x)$ $\checkmark \text{ answer in terms of } x$ $\checkmark \text{ complete square}$ $\checkmark \text{ simplify expression}$ $\checkmark \text{ answer}$	(5)
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QUESTION 6

6.1	$A = P(1+i)^n$ $78\,000 = 39\,000(1 + 0,18)^n$ $2 = (1 + 0,18)^n$ $\log_{(1+0,18)} 2 = n$ $n = 4,187 \text{ years}$ $\therefore \text{year } 2031$	✓ substitution ✓ use of logs ✓ value for n ✓ answer	(4)
6.2.1	$Fv = \frac{x[(1+i)^n - 1]}{i}$ $Fv = \frac{3\,200 \left[\left(1 + \frac{0,0975}{12} \right)^{240} - 1 \right]}{\frac{0,0975}{12}}$ $Fv = R2\,352\,649,68$	✓ value for i and n ✓ substitution into correct formula ✓ R2 352 649,68	(3)
6.2.2	$240 \times R3\,200 = R768\,000$ $\frac{768\,000}{2\,352\,649,68} \times 100$ $= 32,64 \%$ $\therefore 67,36\%$ of the total investment is interest. OR $240 \times R3\,200 = R768\,000$ $R2\,352\,649,68 - R768\,000 = R1\,584\,649,68$ $\frac{1\,584\,649,68}{2\,352\,649,68} \times 100$ $= 67,36\%$	✓ R768 000 ✓ 32,64% ✓ 67,36% ✓ R768 000 ✓ R1 584 649,68 ✓ 67,36%	(3)

6.2.3 $P_v = \frac{x(1 - [1 + i]^{-n})}{i}$ $1\,200\,000 = \frac{x \left(1 - \left[1 + \frac{0,1137}{12} \right]^{-240} \right)}{\frac{0,1137}{12}}$ $x = R12\,689,84$ $\therefore$ Yes, she will be able to afford to purchase the property. OR $P_v = \frac{x(1 - [1 + i]^{-n})}{i}$ $P_v = \frac{13000 \left(1 - \left[1 + \frac{0,1137}{12} \right]^{-240} \right)}{\frac{0,1137}{12}}$ $P_v = R1229330,40$ $\therefore$ Yes, she will be able to afford to purchase the property.	✓ values for i and n ✓ substitution into correct formula ✓ R12 689,84 ✓ conclusion	
		(4)
		[14]

QUESTION 7

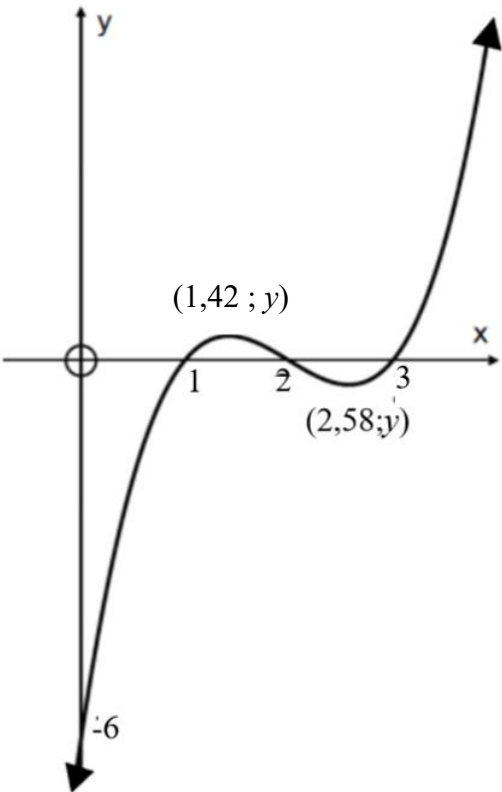
7.1	$f(x) = -x + 2x^2$ $f(x+h) = -(x+h) + 2(x+h)^2$ $f(x+h) = -x-h+2(x^2+2xh+h^2)$ $f(x+h) = -x-h+2x^2+4xh+2h^2$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{-x-h+2x^2+4xh+2h^2 - (-x+2x^2)}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{-x-h+2x^2+4xh+2h^2+x-2x^2}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{-h+4xh+2h^2}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{h(-1+4x+2h)}{h}$ $f'(x) = \lim_{h \rightarrow 0} (-1+4x+2h)$ $f'(x) = -1+4x$ OR $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{-(x+h) + 2(x+h)^2 - (-x+2x^2)}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{-x-h+2x^2+4xh+2h^2 - (-x+2x^2)}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{-x-h+2x^2+4xh+2h^2+x-2x^2}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{-h+4xh+2h^2}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{h(-1+4x+2h)}{h}$ $f'(x) = \lim_{h \rightarrow 0} (-1+4x+2h)$ $f'(x) = -1+4x$ NOTE: Penalise ONE mark for incorrect notation in this question.	✓ $f(x+h)$ ✓ substitution ✓ simplification ✓ factorisation ✓ answer ✓ substitution ✓ $f(x+h)$ ✓ simplification ✓ factorisation ✓ answer	(5)
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7.2	$y = 2x^3 - 6x^2 + 1$ $\frac{dy}{dx} = 6x^2 - 12x$	✓ $6x^2$ ✓ $-12x$	(2)
7.3	$f(x) = \frac{\sqrt{x}}{x} - 9x$ $g(x) = -16x$ $D_x \left[f(x) + \frac{1}{2}g(x) \right]$ $D_x \left[\frac{\sqrt{x}}{x} - 9x + \frac{1}{2}(-16x) \right]$ $D_x \left[x^{\frac{1}{2}} \cdot x^{-1} - 9x - 8x \right]$ $D_x \left[x^{-\frac{1}{2}} - 17x \right]$ $= -\frac{1}{2}x^{-\frac{3}{2}} - 17$	✓ substitution ✓ $x^{-\frac{1}{2}}$ ✓ $-17x$ ✓ derivative of first term IF exponent is negative ✓ derivative of second term	(5)

[12]

QUESTION 8

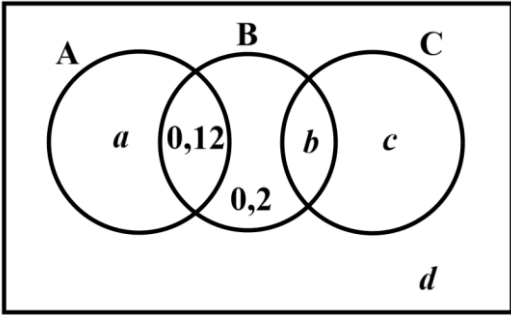
8.1	$f(x) = x^3 - ax^2 + bx - 6$ $f'(x) = 3x^2 - 2ax + b$ $f''(x) = 6x - 2a$ $f''(2) = 6(2) - 2a = 0$ $12 = 2a$ $\therefore a = 6$ $f'(x) = 3x^2 - 2(-6)x + b$ $26 = 3(-1)^2 + 12(-1) + b$ $\therefore b = 11$	✓ $f'(x)$ ✓ $f''(x) = 0$ ✓ substitution ✓ sub $(-1; 26)$ into $f'(x)$	(4)
8.2	$f(x) = x^3 - 6x^2 + 11x - 6$ $f(x) = (x-1)(x^2 - 5x + 6)$ $f(x) = (x-1)(x-2)(x-3)$ $x = 1$ of $x = 2$ of $x = 3$ Accept any method	✓ trinomial ✓ factors ✓ both other x-values	(3)

8.3	$f(x) = x^3 - 6x^2 + 11x - 6$ $f'(x) = 3x^2 - 12x + 11$ $0 = 3x^2 - 12x + 11$ $x = \frac{-(-12) \pm \sqrt{(-12)^2 - 4(3)(11)}}{2(3)}$ $x = \frac{6 \pm \sqrt{3}}{3}$ $x \neq 2,58$ or $x = 1,42$	✓ derivative = 0 ✓ substitution into quadratic formula ✓ answer with selection	(3)
8.4	$f''(x) = 6x - 12$ $f''(4) = 6(4) - 12$ $f''(4) = 12$ $f''(x) > 0 \therefore$ concave up	✓ sub $x = 4$ into $f''(x)$ ✓ answer ✓ interpretation	(3)
8.5		✓ shape ✓ all intercepts ✓ both turning points	(3)
8.6	$f'(x) = 3x^2 - 6x + 11$ $f'(0) = 11$ $y = 11x - 6$	✓ $m = 11$ ✓ answer	(2)
			[18]

QUESTION 9

9.1	Horizontal length = $2x$ Vertical length $= g(x) - f(x)$ $= -x^2 + 12 - \left(\frac{1}{2}x^2 - 6 \right)$ $= -\frac{3}{2}x^2 + 18$	✓ horizontal length = $2x$ ✓ $g(x) - f(x)$ ✓ $= -\frac{3}{2}x^2 + 18$	(3)
9.2	$A(x) = 2x \times \left(-\frac{3}{2}x^2 + 18 \right)$ $A(x) = -3x^3 + 36x$ $A'(x) = -9x^2 + 36$ $9x^2 - 36 = 0$ $9(x^2 - 4) = 0$ $(x - 2)(x + 2) = 0$ $\therefore x = 2 \text{ or } x = -2$ $A(2) = -3(2)^3 + 36(2)$ $A = 48 \text{ units}^2$ NOTE: derivative = 0 must be explicitly stated and may not be implied.	✓ setting up expression ✓ simplification of expression ✓ derivative=0 ✓ both values of x ✓ answer	(5)
			[8]

QUESTION 10

10.1.1	$P(A \text{ and } C) = 0$	✓ answer	(1)
10.1.2	$P(B \text{ and } C) = P(B) \times P(C)$ $P(B \text{ and } C) = 0,4 \times 0,2$ $P(B \text{ and } C) = 0,08 \text{ or } \frac{2}{25}$	✓ $0,4 \times 0,2$ ✓ answer	(2)
			
10.2	$a = 0,18 \text{ or } \frac{9}{50}$ $b = 0,08 \text{ or } \frac{2}{25}$ $c = 0,12 \text{ or } \frac{3}{25}$ $d = 0,3 \text{ or } \frac{3}{10}$	✓ value of a ✓ value of b ✓ value of c ✓ value of d	(4) [7]

QUESTION 11

11.1	$9!$ $= 362\,880$	✓ $9!$ ✓ answer ($9!$ or $362\,880$)	(2)
11.2.1	$3! \times 7!$ $= 30\,240$ $P(\text{together}) = \frac{3! \times 7!}{9!}$ $P(\text{together}) = \frac{30\,240}{362\,880}$ $P(\text{together}) = \frac{1}{12}$ OR $3! \times 11!$ $= 239500800$ $P(\text{together}) = \frac{3! \times 11!}{13!}$ $P(\text{together}) = \frac{1}{26}$	✓ $3! \times 7!$ ✓ method ✓ answer ✓ $3! \times 11!$ or 239500800 ✓ method (divide by $13!$) ✓ answer	(3)
11.2.2	Total! – together! $= 9! - (2! \times 8!)$ $= 282\,240$ OR Total! – together! $= 13! - (2! \times 10!)$ $= 62\,197\,632\,000$	✓ method ✓ $2! \times 8!$ ✓ answer ✓ method ✓ $2! \times 10!$ ✓ answer	(3)
			[8]

TOTAL: 150

FINAL



KWAZULU-NATAL PROVINCE

EDUCATION
REPUBLIC OF SOUTH AFRICA

**STANDARDISED PROVINCIAL
ASSESSMENT**

GRADE 12

MATHEMATICS P1

SEPTEMBER 2026

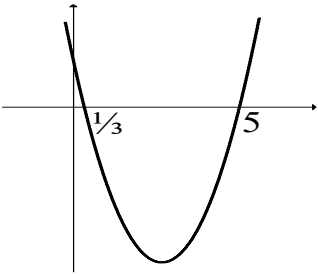
PREPARATORY EXAMINATION

MARKING GUIDELINES

MARKS: 150

These marking guidelines consist of 16 pages.

QUESTION 1

1.1.1	$2x - 4x^2 = 0$ $2x(1 - 2x) = 0$ $x = 0$ or $x = \frac{1}{2}$	✓ A common factor ✓ CA ✓ CA answers (3)
1.1.2	$x^2 - 5 = -8x$ $x^2 + 8x - 5 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-(8) \pm \sqrt{(8)^2 - 4(1)(-5)}}{2(1)}$ $x = -8,58$ or $x = 0,58$ Penalise for incorrect rounding: 1 mark; only in this question.	✓ A standard form ✓ CA substitution ✓ CA ✓ CA answers (4)
1.1.3	$3x^2 - 16x \leq -5$ $3x^2 - 16x + 5 \leq 0$ $(3x - 1)(x - 5) \leq 0$ CVs: $\frac{1}{3}$; 5  $\frac{1}{3} \leq x \leq 5$ OR $x \in \left[\frac{1}{3}; 5\right]$	✓ A $3x^2 - 16x + 5 \leq 0$ ✓ CA critical values ✓✓ CA CA answer (4)
1.1.4	$(\sqrt{x-1} - 3)(\sqrt{x-1} + 2) = -6$ $x - 1 - \sqrt{x-1} - 6 = -6$ $\sqrt{x-1} = x - 1$ $(\sqrt{x-1})^2 = (x-1)^2$ $x - 1 = x^2 - 2x + 1$ $x^2 - 3x + 2 = 0$ $(x-1)(x-2) = 0$ $x = 1$ or $x = 2$ OR	✓ A LHS of equation ✓ CA isolating the surd ✓ CA squaring both sides ✓ CA standard form ✓ CA both answers (5)

	Let $k = \sqrt{x-1}$: $\therefore (k-3)(k+2) = -6$ $k^2 - k - 6 = -6$ $k^2 - k = 0$ $k(k-1) = 0$ $k = 0 \quad \text{or} \quad k = 1$ $\sqrt{x-1} = 1 \quad \text{or} \quad \sqrt{x-1} = 0$ $x-1 = 1 \quad \quad \quad x-1 = 0$ $x = 2 \quad \quad \quad x = 1$	✓A $k^2 - k - 6 = -6$ ✓CA factorisation ✓CA values of k ✓CA squaring both sides ✓CA both answers (5)
1.2	$x - 2y = 3$ $x = 3 + 2y$ $3y^2 - 5xy = 24 + 16y$ $3(3+2y)^2 - 5y(3+2y) = 24 + 16y$ $2y^2 + 5y + 3 = 0$ $(2y+3)(y+1) = 0$ $y = -\frac{3}{2} \quad \text{or} \quad y = -1$ $x = 3 + 2\left(-\frac{3}{2}\right) \quad \text{or} \quad x = 3 + 2(-1)$ $x = 0 \quad \quad \quad \text{or} \quad x = 1$ OR $y = \frac{x-3}{2}$ $3x^2 - 5xy = 24 + 16y$ $3x^2 - 5x\left(\frac{x-3}{2}\right) = 24 + 16\left(\frac{x-3}{2}\right)$ $x^2 - x = 0$ $x(x-1) = 0$ $x = 0 \quad \text{or} \quad x = 1$ $y = \frac{0-3}{2} \quad \text{or} \quad y = \frac{1-3}{2}$ $y = -\frac{3}{2} \quad \text{or} \quad y = -1$	✓A making x subject of the formula ✓CA substitution ✓CA standard form ✓CA y-values ✓CA x-values (5) OR ✓A making y the subject of the formula ✓CA substitution ✓CA standard form ✓CA x-values ✓CA y-values (5)

1.3	$7^{\frac{x}{2}} + 5^{\frac{y}{3}} = 7^2 + 5^1$ $\frac{x}{2} = 2$ and $\frac{y}{3} = 1$ $x = 4$ and $y = 3$ $\therefore P = 4 \times 3$ $P = 12$	✓A $7^{\frac{x}{2}} + 5^{\frac{y}{3}} = 7^2 + 5^1$ ✓A equating exponents with the same base ✓A value of x and value of y ✓A value of P (4)
		[25]

QUESTION 2

2.1.	$a + 3d = 15 \dots(1)$ $a + 11d = 47 \dots(2)$ Subtract (1) from (2): $8d = 32$ $d = 4$ $a + 3(4) = 15$ $a = 3$ $3 ; 7 ; \dots\dots$	✓A both equations ✓CA solving simultaneously ✓CA value of d ✓CA answer (4)
2.2.1	$\frac{9}{4}$	✓A answer (1)
2.2.2	$r = \frac{1}{2}$ $S_{\infty} = \frac{a}{1-r}$ $= \frac{18}{1-\frac{1}{2}}$ $= 36$ $S_6 = \frac{a(r^n - 1)}{r - 1}$ $= \frac{18 \left[\left(\frac{1}{2} \right)^6 - 1 \right]}{\frac{1}{2} - 1}$ $= 35,44$ $\therefore$ Total area of squares smaller than Square 6 $= 36 - 35,44 = 0,56 \text{ cm}^2$ OR	✓A value of r ✓CA substitution in S_{∞} ✓CA value of S_{∞} ✓CA substitution in S_6 ✓CA value of S_6 ✓CA answer (6)

332	$r = \frac{1}{2}$ $T_7 = ar^6 = 18\left(\frac{1}{2}\right)^6$ $= \frac{9}{32}$ $S_\infty = \frac{a}{1-r}$ $= \frac{\frac{9}{32}}{1-\frac{1}{2}}$ $= \frac{9}{16} = 0,56$	✓ A value of r ✓ CA substitution in T_7 ✓ CA value of T_7 ✓ CA substitution of a in S_∞ ✓ CA substitution of r in S_∞ ✓ CA answer (6)
2.2.3	side length of Square 1 = $\sqrt{18} = 3\sqrt{2}$ side length of Square 2 = $\sqrt{9} = 3$ $r = \frac{3}{3\sqrt{2}} = \frac{1}{\sqrt{2}}$ $T_n = ar^{n-1}$ $\frac{3}{8} = 3\sqrt{2} \cdot \left(\frac{1}{\sqrt{2}}\right)^{n-1}$ $\left(\frac{1}{\sqrt{2}}\right)^{n-1} = \left(\frac{1}{\sqrt{2}}\right)^7$ $n = 8$ The 8th square will have a side length of $\frac{3}{8}$ cm. OR Area of square = $\left(\frac{3}{8}\right)^2 = \frac{9}{64}$ $a = 18; \quad r = \frac{1}{2}$ $T_n = ar^{n-1}$ $\frac{9}{64} = 18\left(\frac{1}{2}\right)^{n-1}$ $\left(\frac{1}{2}\right)^7 = \left(\frac{1}{2}\right)^{n-1}$ $n = 8$ The 8th square will have a side length of $\frac{3}{8}$ cm.	✓ A side length of Square 1 ✓ CA value of r ✓ CA substitution in $T_n = ar^{n-1}$ ✓ CA same base in LHS and RHS ✓ CA answer (5)
		✓ A area of square ✓ A value of a ✓ CA substitution in $T_n = ar^{n-1}$ ✓ CA same base in LHS and RHS ✓ CA answer (5)

[16]

QUESTION 3

3.1	$\sum_{k=10}^{25} (7-5k) = 7-5(10)+7-5(11)+7-5(12)+... \text{to 16 terms}$ $= -43-48-53+.... \text{ to 16 terms}$ $\therefore a = -43; \quad d = -5$ $n = 16$ $S_n = \frac{n}{2} [2a + (n-1)d]$ $= \frac{16}{2} [2(-43) + 15(-5)]$ $= -1288$ OR $a = -43; \quad l = 7-5(25) = -118$ $n = 16$ $S_n = \frac{n}{2} [a + l]$ $= \frac{16}{2} [-43 - 118]$ $= -1288$	✓A values of a and d ✓A value of n ✓CA substitution ✓CA answer (4) OR ✓A values of a and l ✓A value of n ✓CA substitution ✓CA answer (4)
3.2	$T_4 = a \cdot 4^2 + 4b + 6 = 16a + 4b + 6 = 26$ $16a + 4b = 20$ $4a + b = 5 \text{(1)}$ $T_3 - T_2 = 7$ $9a + 3b + 6 - (4a + 2b + 6) = 7$ $5a + b = 7 \text{(2)}$ $(2) - (1): \quad a = 2$ Substitute $a = 2$ in (1): $4(2) + b = 5$ $b = -5(2) + 7 = -3$	✓A use $T_4 = 26$ to obtain equation i.t.o. a and b ✓A use $T_3 - T_2 = 7$ to obtain equation i.t.o. a and b ✓CA value of a ✓CA value of b (4)
[8]		

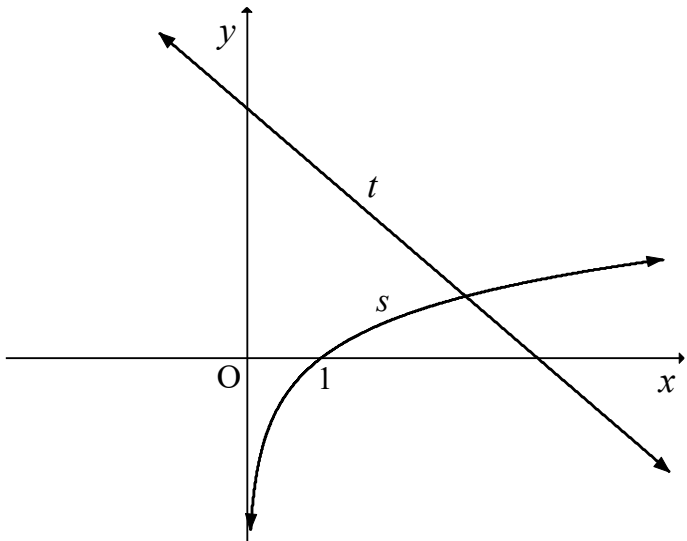
QUESTION 4

4.1	$x = 3$ $y = 2$	✓A $x = 3$ ✓A $y = 2$ (2)
4.2.1	For the x -intercept, $y = 0$: $\therefore 0 = \frac{-9}{x-3} + 2$ $-2(x-3) = -9$ $-2x = -15$ $x = 7\frac{1}{2}$	✓A substitute $y = 0$ ✓A x -intercept (2)
4.2.2	For the y -intercept, $x = 0$: $\therefore y = \frac{-9}{0-3} + 2$ $y = 5$	✓A y -intercept (1)
4.3		✓A shape ✓CA asymptotes ✓CA intercepts (3)
4.4	reflection around the y -axis	✓✓AA answer (2)
4.5	$-5 < p < -2$	✓✓CA; A answer (2)
[12]		

QUESTION 5

5.1	$R(0; -6)$	✓A answer (1)
5.2	$c = -6$ $\therefore y = mx - 6$ Substitute $(-7; 8)$: $8 = m(-7) - 6$ $m = -2$ $\therefore y = -2x - 6$	✓A $c = -6$ ✓CA substitute. $(-7; 8)$ ✓CA answer (3)
5.3	$g(x) = x^2 + 5x - 6$ $= x^2 + 5x + \left(\frac{5}{2}\right)^2 - \left(\frac{5}{2}\right)^2 - 6$ $= \left(x + \frac{5}{2}\right)^2 - \frac{49}{4}$	✓A $\left(x + \frac{5}{2}\right)^2$ ✓A $-\frac{49}{4}$ (2)
5.4	average gradient of TW = -4 $\frac{y-8}{x-(-7)} = -4$ $y-8 = -4(x+7)$ $y = -4x - 20$ $\therefore x^2 + 5x - 6 = -4x - 20$ $x^2 + 9x + 14 = 0$ $(x+7)(x+2) = 0$ $x \neq -7 \text{ or } x = -2$ $\therefore W(-2; -12)$	✓A substitution for ave. gradient ✓CA y subject of the formula ✓CA substitute $y = x^2 + 5x - 6$ ✓CA factors ✓CA answer (5)
5.5	For x intercept of h: $-2x - 6 = 0$ $x = -3$ $\frac{g(x)}{h(x)} \leq 0 \text{ for } -6 \leq x < -3 \text{ or } x \geq 1$	✓CA x intercept of h ✓✓CA $-6 \leq x < -3$ ✓A $x \geq 1$ (4)
		[15]

QUESTION 6

6.1		s: ✓ A shape ✓ A x-intercept of 1 (2)
6.2	$s^{-1}: \quad x = \log_3 y$ $\therefore y = 3^x$ Answer only: Full marks	✓ A swapping of x and y ✓ A answer (2)
6.3	Rewrite $\log_3(4-x) = x$: $3^x = 4-x$ or: $3^x = -x+4$ Reflect the graph of s in the line $y = x$ to obtain the graph of the inverse: $s^{-1}(x) = 3^x$. The x-coordinate of the point of intersection between $t(x) = -x+4$ and $s^{-1}(x) = 3^x$ will be the solution of $3^x = 4-x$, and therefore also of: $\log_3(4-x) = x$.	✓ A $3^x = -x+4$ ✓ A reflect in the line $y = x$ ✓ A point of intersection between t and s^{-1} (3)
6.4	$x = 1$	✓ A answer (1)
[8]		

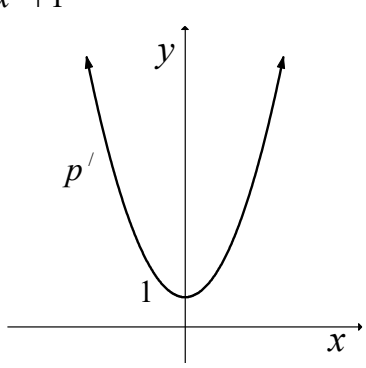
QUESTION 7

7.1	Let $P = x$; $A = 2x$; $n = \text{number of years}$ $A = P(1+i)^n$ $2x = x\left(1 + \frac{0,073}{4}\right)^{4n}$ $2 = 1,01825^{4n}$ $4n = \log_{1,01825} 2$ $n = 9,58$ After 9,6 years.	✓A $P = x$ and $A = 2x$ or $\frac{A}{P} = 2$ ✓A substitution ✓CA use of logarithms ✓CA answer (4)
7.2	$F = \frac{x[(1+i)^n - 1]}{i}$ $F = \frac{2500\left[\left(1 + \frac{0,08}{12}\right)^{60} - 1\right]}{\frac{0,08}{12}}$ $= R183\,692,14$	✓A $n = 60$ ✓A $i = \frac{0,08}{12}$ ✓CA substituting into correct formula ✓CA answer (4)
7.3.1	$P = \frac{x[1 - (1+i)^{-n}]}{i}$ $82\,000 = \frac{3\,200\left[1 - \left(1 + \frac{0,12}{12}\right)^{-n}\right]}{\frac{0,12}{12}}$ $\left(1 + \frac{0,12}{12}\right)^{-n} = 1 - \frac{82\,000 \times \frac{0,12}{12}}{3\,200}$ $= 0,74375$ $-n = \log_{\left(1 + \frac{0,12}{12}\right)} 0,74375$ $n = 29,75281189\dots$ She will have to pay 30 instalments.	✓A substituting into correct formula ✓CA use of logarithms ✓CA value of n ✓CA answer (4)

7.3.2	Outstanding balance after 29 instalments = present value of outstanding instalments $= \frac{x \left[1 - (1+i)^{-n} \right]}{i}$ $= \frac{3200 \left[1 - \left(1 + \frac{0,12}{12} \right)^{-0,75281189...} \right]}{\frac{0,12}{12}}$ $= R2388,08$ Final instalment = $2388,08 \left(1 + \frac{0,12}{12} \right)^1$ = R2411,96 OR OB = A – F $= P(1+i)^n - \frac{x \left[(1+i)^n - 1 \right]}{i}$ $= 82000 \left(1 + \frac{0,12}{12} \right)^{29} - \frac{3200 \left[\left(1 + \frac{0,12}{12} \right)^{29} - 1 \right]}{\frac{0,12}{12}}$ $= R2388,08$ Final instalment = $2388,08 \left(1 + \frac{0,12}{12} \right)^1$ = R2411,96 OR $82000 = \frac{3200 \left[1 - \left(1 + \frac{0,12}{12} \right)^{-29} \right]}{\frac{0,12}{12}} + \text{Final instalment} \left(1 + \frac{0,12}{12} \right)^{-30}$ $\text{Final instalment} = \left(82000 - \frac{3200 \left[1 - \left(1 + \frac{0,12}{12} \right)^{-29} \right]}{\frac{0,12}{12}} \right) \div \left(1 + \frac{0,12}{12} \right)^{-30}$ $= R2411,96$	✓CA substituting into correct formula ✓CA compounding ✓CA answer (3) OR ✓CA substituting into correct formula ✓CA compounding ✓CA answer (3)
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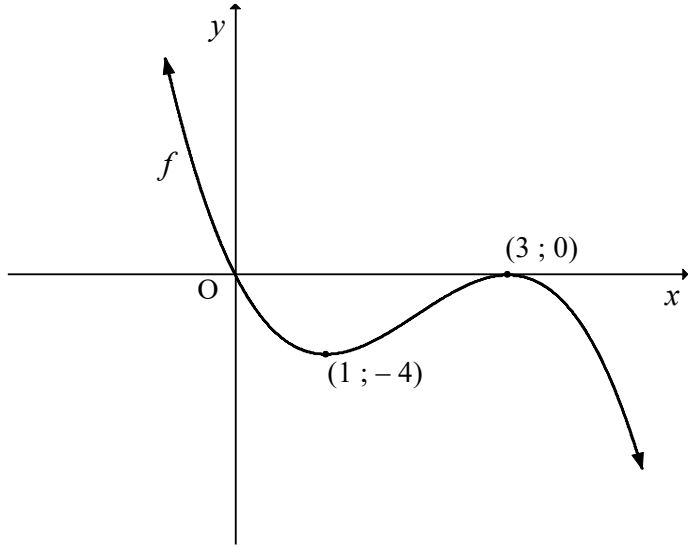
[15]

QUESTION 8

8.1	$f(x+h) = (x+h) - 3(x+h)^2$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{(x+h) - 3(x+h)^2 - (x - 3x^2)}{h}$ $= \lim_{h \rightarrow 0} \frac{x+h-3x^2-6xh-3h^2-x+3x^2}{h}$ $= \lim_{h \rightarrow 0} \frac{h-6xh-3h^2}{h}$ $= \lim_{h \rightarrow 0} \frac{h(1-6x-3h)}{h}$ $= \lim_{h \rightarrow 0} (1-6x-3h)$ $= 1-6x$ Penalise for incorrect notation, one mark, only in this question.	✓A expression for $f(x+h)$ ✓CA substitution ✓CA simplification ✓CA common factor ✓CA answer (5)
8.2	$D_x \left(\frac{4x^2 + x + 2\sqrt{x}}{2x^2} \right)$ $= D_x \left(2 + \frac{1}{2}x^{-1} + x^{-\frac{3}{2}} \right)$ $= -\frac{1}{2}x^{-2} - \frac{3}{2}x^{-\frac{5}{2}}$	✓A $2 + \frac{1}{2}x^{-1}$ ✓A $x^{-\frac{3}{2}}$ ✓CA $-\frac{1}{2}x^{-2}$ ✓CA $-\frac{3}{2}x^{-\frac{5}{2}}$ (4)
8.3	$p(x) = 5x^3 + x$ $p'(x) = 15x^2 + 1$ $15x^2 \geq 0$, for all $x \in R$ $15x^2 + 1 > 0$ for all $x \in R$ $\therefore p'(x) > 0$, for all $x \in R$ p is increasing for all $x \in R$ OR $p'(x) = 15x^2 + 1$  $\therefore p'(x) > 0$, for all $x \in R$ p is increasing for all $x \in R$	✓A derivative ✓A $15x^2 \geq 0$, for all $x \in R$ ✓A $p'(x) > 0$, for all $x \in R$ (3) OR ✓A derivative ✓A graph of $p'(x)$ is above x-axis for all $x \in R$ ✓A $p'(x) > 0$, for all $x \in R$ (3)

[12]

QUESTION 9

9.1.1		✓A shape ✓A passing through origin ✓A x-intercept (3;0) ✓A turning point: (1;-4) (4)
9.1.2	(3 ; 4)	✓A answer ✓A answer (2)
9.1.3	$f(x) = -x(x-3)^2$ $= -x(x^2 - 6x + 9)$ $= -x^3 + 6x^2 - 9x$ $f'(x) = -3x^2 + 12x - 9$ $f''(x) = -6x + 12$	✓A $-x^3 + 6x^2 - 9x$ ✓CA $f'(x)$ ✓CA $f''(x)$ (3)
9.1.4	$f''(0) = -6(0) + 12 = 12$ $\therefore f''(0) > 0$ $\therefore \text{the graph of } f \text{ is concave up at } (0 ; 0).$	✓CA value of $f''(0)$ ✓CA show that $f''(0) > 0$ ✓CA answer (3)
9.2	$y = 12x + k$ will be a tangent to g when: $3x^2 = 12$ $x^2 = 4$ $x = 2 \quad \text{or} \quad x = -2$ For $x = 2$: $x^3 + 1 = 12x + k$ $2^3 + 1 = 12(2) + k$ $\therefore k = -15$ For $x = -2$: $x^3 + 1 = 12x + k$ $(-2)^3 + 1 = 12(-2) + k$ $\therefore k = 17$ $y = 12x + k$ will be intersecting g at 3 distinct points for $-15 < k < 17$. OR	✓A equating derivatives ✓CA x-values ✓CA value of k ✓CA value of k ✓CA answer (5) OR

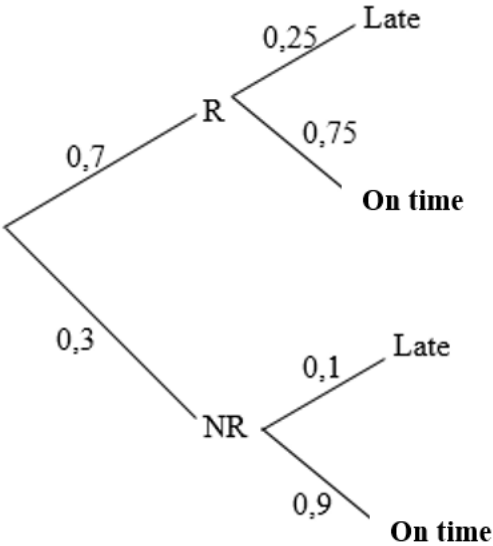
9.2	$y = 12x + k$ will be a tangent to g when: $3x^2 = 12$ $x^2 = 4$ $x = 2 \quad \text{or} \quad x = -2$ For $x = 2$: $x^3 + 1 = 12x + k$ $2^3 + 1 = 12(2) + k$ $\therefore k = -15$ For $x = -2$: $x^3 + 1 = 12x + k$ $(-2)^3 + 1 = 12(-2) + k$ $\therefore k = 17$ $y = 12x + k$ will be intersecting g at 3 distinct points for $-15 < k < 17$. OR $g(x) = 12x + k$ $x^3 + 1 = 12x + k$ $x^3 - 12x + 1 = k$ Consider the graph of $x^3 - 12x + 1$: Turning points when $3x^2 - 12 = 0$ $x^2 = 4$ $x = 2 \quad \text{or} \quad x = -2$ For $x = 2$: $x^3 + 1 = 12x + k$ $2^3 + 1 = 12(2) + k$ $\therefore k = -15$ For $x = -2$: $x^3 + 1 = 12x + k$ $(-2)^3 + 1 = 12(-2) + k$ $\therefore k = 17$ $y = 12x + k$ will be intersecting g at 3 distinct points for $-15 < k < 17$.	✓A equating derivatives ✓CA x-values ✓CA value of k ✓CA value of k ✓CA answer (5) OR ✓A $x^3 + 1 = 12x + k$ ✓CA x-values ✓CA value of k ✓CA value of k ✓CA answer (5)
[17]		

QUESTION 10

10.1	$\text{TSA of box} = 2(x)(x) + 2(x)(h) + 2(x)(h) = 2x^2 + 4xh$ $2x^2 + 4xh = 1350$ $h = \frac{1350}{4x} - \frac{x}{2}$ $\text{Volume} = x^2h$ $= x^2 \left(\frac{1350}{4x} - \frac{x}{2} \right)$ $V(x) = \frac{675x}{2} - \frac{x^3}{2}$	✓A expression for TSA ✓A equating to 1350 ✓A $h = \frac{1350}{4x} - \frac{x}{2}$ ✓A substitution into formula for volume of rectangular prism (4)
10.2	$V'(x) = \frac{675}{2} - \frac{3x^2}{2}$ For maximum volume: $V'(x) = 0$ $3x^2 = 675$ $x^2 = 225$ $x = 15 \text{ cm}$	✓A derivative ✓A derivative = 0 ✓CA answer (3)
[7]		

QUESTION 11

11.1.1	$P(A \text{ and } B) = P(A) \times P(B)$ $0,28 = (0,42 + 0,28) \times (0,28 + x)$ $0,4 = 0,28 + x$ $x = 0,4 - 0,28$ $x = 0,12$	✓A subst. into correct formula ✓A simplification ✓CA answer (3)
11.1.2	$y = 1 - 0,82 = 0,18$	✓CA answer (1)
11.1.3	$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$ $= 0,42 + 0,28 - 0,28$ $= 0,82$ OR $P(A \text{ or } B) = 0,42 + 0,28 + 0,12$ $= 0,82$ OR $P(A \text{ or } B) = 1 - y$ $= 0,82$	✓CA answer (1) OR ✓CA answer (1) OR ✓CA answer (1)

11.2	 $P(\text{on time when raining}) = 0,7 \times 0,75$ $P(\text{on time when not raining}) = 0,3 \times 0,9$ $P(\text{on time}) = (0,7 \times 0,75) + (0,3 \times 0,9)$ $= 0,795$	✓A 0,7×0,75 ✓A 0,3×0,9 ✓CA adding ✓CA answer (4)
11.3.1	8!= 40 320	✓A answer (1)
11.3.2	8.7.6.5 = 1680	✓A answer (1)
11.3.3	$n(S) = 2!6! = 1440$ $n(\text{event}) = 2!3!3!2! = 144$ $P(\text{event}) = \frac{n(\text{event})}{n(S)} = \frac{144}{1440}$ $= \frac{1}{10}$ OR $n(S) = 2!6! = 2!720$ $= 2!(3!3! + 3!3!) = 2!72$ $= \frac{2!72}{2!720}$ $= \frac{1}{10}$	✓A n(S) ✓A n(event) ✓CA $\frac{n(\text{event})}{n(S)}$ ✓CA answer (4)
[15]		

TOTAL:

150



LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
EDUCATION

**NATIONAL SENIOR CERTIFICATE /
*NASIONALE SENIOR SERTIFIKAAT***

GRADE/*GRADE* 12

**MATHEMATICS P1/*WISKUNDE V1*
MARKING GUIDELINES/*NASIENRIGLYNE*
SEPTEMBER 2026**

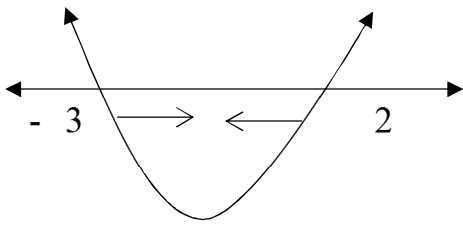
MARKS/*PUNTE*: 150

This marking guidelines consists of 18 pages/ *Hierdie nasienriglyne bestaan uit 18 bladsye*

NOTE/NOTA:

- If a candidate answers a question TWICE, only mark the FIRST attempt/ *As 'n kandidaat 'n vraag TWEE keer beantwoord, merk slegs die EERSTE poging*
- Consistent accuracy applies in ALL aspects of the marking guidelines/ *Konsekwente akkuraatheid is van toepassing in ALLE aspekte van die nasienriglyne*

QUESTION 1/VRAAG 1

1.1	1.1.1	$y + \frac{1}{y} = 2$ $y^2 - 2y + 1 = 0$ $(y-1)(y-1) = 0$ $y = 1$	✓ standard form/ <i>standaardvorm</i> ✓ answer/ <i>antwoord</i>	(2)
	1.1.2	$(2x^2 + 3x) + \frac{1}{(2x^2 + 3x)} = 2$ $2x^2 + 3x = 1$ $2x^2 + 3x - 1 = 0$ $x = \frac{-3 \pm \sqrt{(3)^2 - 4(2)(-1)}}{2(2)}$ $x = -1,78 \quad \text{or / of} \quad x = 0,28$	✓ standard form/ <i>standaardvorm</i> ✓ substitution/ <i>vervanging</i> ✓ answer/ <i>antwoord</i> ✓ answer/ <i>antwoord</i>	(4)
1.2	1.2.1	$x^2 + x - 6 < 0$ $(x+3)(x-2) < 0$ CV $x = -3$ or / of $x = 2$  $-3 < x < 2$	✓ critical values/ <i>kritieke waardes</i> ✓✓ answer/ <i>antwoord</i>	(3)

	1.2.2	$5 + \sqrt{x+5} = \frac{14}{\sqrt{x+5}}$ $5\sqrt{x+5} + x + 5 = 14$ $5\sqrt{x+5} = 9 - x$ $25(x+5) = 81 - 18x + x^2$ $x^2 - 43x - 44 = 0$ $(x-44)(x+1) = 0$ $x \neq 44 \quad \text{or / of} \quad x = -1$	✓ cross multiply/ <i>maal KGV</i> ✓ isolating surds/ <i>isoleer wortel</i> ✓ squaring/ <i>vierkant</i> ✓ standard form/ <i>standaardvorm</i> ✓ answer with selection/ <i>antwoord met seleksie</i>	(5)
	1.2.3	$9^{x+1} - 10 \cdot 3^x + 1 = 0$ $3^{2x} \cdot 9 - 10 \cdot 3^x + 1 = 0$ $(9 \cdot 3^x - 1)(3^x - 1) = 0$ $3^x = \frac{1}{9} \quad \text{or / of} \quad 3^x = 1$ $3^x = 3^{-2} \quad \text{or / of} \quad 3^x = 3^0$ $x = -2 \quad \text{or / of} \quad x = 0$	✓ factorisation/ <i>faktorisering</i> ✓ both equations/ <i>beide vgl</i> ✓ answer/ <i>antwoord</i> ✓ answer/ <i>Antwoord</i>	(4)
1.3	1.3.1	Surface Area / <i>Buite oppervlakte</i> $= 2lb + 2lh + 2bh$ $2x^2 + 2xy + 2xy = 288$ $2x^2 + 4xy = 288$ $x^2 + 2xy - 144 = 0$	✓ $2x^2 + 2xy + 2xy = 288$ ✓ $2x^2 + 4xy = 288$	(2)
	1.3.2	$x^2 + 2xy - 144 = 0$ $y = 21 - 2x$ $x^2 + 2x(21 - 2x) - 144 = 0$ $x^2 + 42x - 4x^2 - 144 = 0$ $-3x^2 + 42x - 144 = 0$ $x^2 - 14x + 48 = 0$ $(x-6)(x-8) = 0$ $x = 6 \quad \text{or / of} \quad x = 8$ $y = 9 \quad \text{or / of} \quad y = 5$ OR/OF	✓ substitution/ <i>vervanging</i> ✓ standard form/ <i>standaardvorm</i> ✓ x - values/ <i>waardes</i> ✓ y - values/ <i>waardes</i> OR/OF	(4)

		$x^2 + 2xy - 144 = 0$ $\frac{21-y}{2} = x$ $\left(\frac{21-y}{2}\right)^2 + 2y\left(\frac{21-y}{2}\right) - 144 = 0$ $\frac{441 - 42y + y^2}{4} + \frac{42y - 2y^2}{2} - 144 = 0$ $441 - 42y + y^2 + 84y - 4y^2 - 576 = 0$ $-3y^2 + 42y - 135 = 0$ $y^2 - 14y + 45 = 0$ $(y-5)(y-9) = 0$ $y = 5 \quad \text{or / of} \quad y = 9$ $x = 8 \quad \text{or / of} \quad x = 6$	✓ substitution/<i>vervanging</i> ✓ standard form/<i>standaardvorm</i> ✓ y - values/<i>waardes</i> ✓ x - values /<i>waardes</i>	(4)
				[24]

QUESTION 2/VRAAG 2

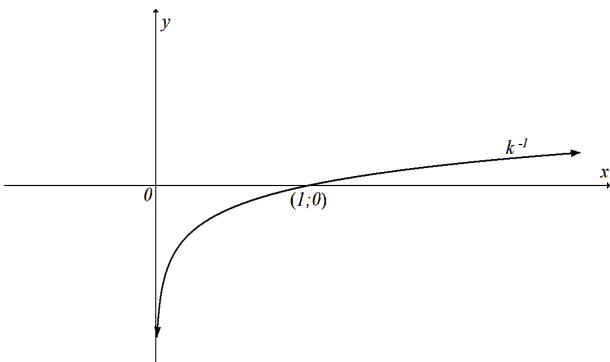
2.1	2.1.1	$r = \frac{T_2}{T_1} = \frac{(x-3)^2}{(x-3)}$ $r = (x-3)$ $-1 < (x-3) < 1$ $2 < x < 4$	✓ value of r /waarde van r ✓ condition/voorwaarde ✓ answer/Antwoord	(3)
	2.1.2	$S_{\infty} = \frac{x-3}{1-(x-3)}$ $= \frac{x-3}{4-x}$	✓ substitution/vervanging ✓ answer/Antwoord	(2)
	2.1.3	$S_{\infty} = \frac{2.5-3}{1-(2.5-3)}$ $= \frac{2.5-3}{4-2.5}$ $= -0.33$	✓ substitution/vervanging ✓ answer/Antwoord	(2)
2.2	2.2.1	$4 + 6 + 8 + \dots$ $a = 4$ $d = 2$ $\frac{n}{2}[8 + (n-1)2] = 990$ $\frac{n}{2}[2n + 6] = 990$ $n^2 + 3n - 990 = 0$ $(n-30)(n+33) = 0$ $n = 30 \quad \text{or / of} \quad n \neq -33$	✓ expansion/uitbrei ✓ substitution/vervanging ✓ standard form/standaardvorm ✓ answer with selection/antwoord <i>met seleksie</i>	(4)

	2.2.2	$T_n = a + (n-1)d$ $T_{30} = 30 + 29(2)$ $= 62$ $S_n - S_{n-1} = S_{30} - S_{29}$ $= 990 - \left[\frac{29}{2} [8 + 28(2)] \right]$ $= 990 - 928$ $= 62$ $\therefore T_{30} = S_{30} - S_{29}$	✓substitution/ <i>vervang</i> ✓answer/ <i>antwoord</i> ✓substitution/ <i>vervang</i> ✓answer/ <i>antwoord</i>	(4)
				[15]

QUESTION 3/VRAAG 3

3.1	$-1 ; 1 ; 3 ; 5 ; \dots$ $a = -1$ $d = 2$ $T_{10} = -1 + 9(2)$ $= 17$	✓ first difference/ <i>eerste verskil</i> ✓ substitution/ <i>vervanging</i> ✓ answer/ <i>antwoord</i>	(3)
3.2	$T_{30} = -1 + 29(2)$ $= 57$	✓ substitution/ <i>vervanging</i> ✓ answer/ <i>antwoord</i>	(2)
3.3	$2a = 2$ $a = 1$ $3a + b = -1$ $3(1) + b = -1$ $b = -4$ $a + b + c = 3$ $1 - 4 + c = 3$ $c = 6$	✓ $2a = 2$ ✓ $3(1) + b = -1$ ✓ $1 - 4 + c = 3$	(3)
3.4	The minimum value in the sequence is 2/ <i>Die minimum waarde in die reeks is 2</i>	✓ answer/ <i>antwoord</i>	(1)
			[9]

QUESTION 4/VRAAG 4

4.1	$B(0 ; -8)$ $3^x - 9 = 0$ $3^x = 9$ $3^x = 3^2$ $x = 2$ $A(2 ; 0)$	$\checkmark B(0 ; -8)$ $\checkmark$ equate to zero/stel gelyk 0 $\checkmark x$ – value/waarde	(3)
4.2	$g(x) = 3^x - 9$ $k(x) = g(x) + 9$ $k(x) = 3^{2x} - 9 + 9$ $k(x) = 9^x$	$\checkmark$ substitution/vervanging $\checkmark$ answer/antwoord	(2)
4.3	$y = 9^x$ $x = 9^y$ $y = \log_9 x$	$\checkmark$ interchange x and y /ruil x en y $\checkmark$ answer/antwoord	(2)
4.4		$\checkmark$ shape/vorm $\checkmark (1 ; 0)$	(2)
4.5	$x > 0$	$\checkmark$ domain/definisieversameling	(1)
4.6	$h(x) = -k^{-1}(x)$ $= -\log_9(x)$	$\checkmark h(x) = -k^{-1}(x)$ $\checkmark$ answer/antwoord	(2)
4.7	$\sum_{x=0}^2 9^x - \sum_{x=3}^4 g(x)$ $= [1 + 9 + 81] - [9 + 72]$ $= 91 - 81$ $= 10$	$\checkmark [1 + 9 + 72]$ $\checkmark [9 + 72]$ $\checkmark$ answer/antwoord	(3)
			[15]

QUESTION 5/VRAAG 5

5.1	$y = \frac{a}{x-1} + 2$ through / <i>deur</i> (0 ; 0) $0 = \frac{a}{-1} + 2$ $0 = -a + 2$ $a = 2$ $f(x) = \frac{2}{x-1} + 2$	✓subst p and q /verv p en q ✓subst (0 ; 0)/vervang (0 ; 0) ✓value of a /waarde van a	(3)
5.2	$y = mx + c$ $y = mx + 0$ through / <i>deur</i> D (1 ; 2) $2 = m(1) + 0$ $m = 2$ $y = 2x$	✓substitute c /vervang c ✓gradient/ <i>gradiënt</i> ✓answer/ <i>antwoord</i>	(3)
5.3	$\frac{2}{x-1} + 2 = 2x$ $\frac{2}{x-1} = 2x - 2$ $2 = (2x - 2)(x - 1)$ $2x^2 - 4x = 0$ $2x(x - 2) = 0$ $x \neq 0$ or / <i>of</i> $x = 2$ $y = 4$ C (2 ; 4)	✓equating/ <i>gelykstel</i> ✓simplification/ <i>vereenvoudiging</i> ✓standard form/ <i>standaardvorm</i> ✓both values of x and y / <i>beide waardes van x en y</i>	(4)
5.4	$x < 0$ or / <i>of</i> $1 < x < 2$	✓ $x < 0$ ✓ $1 < x < 2$ OR/OF (1 ; 2)	(2)
5.5	$-\infty < x < 1 ; x \neq 0$	✓ $-\infty < x < 1$ ✓ $x \neq 0$	(2)
			[14]

QUESTION 6/VRAAG 6

6.1	$y = a(x + p)^2 + q$ $y = a(x - 1)^2 - 3$ subst / verv (0 ; -1) $-1 = a(0 - 1)^2 - 3$ $a = 2$ $y = 2(x - 1)^2 - 3$ $= 2(x^2 - 2x + 1) - 3$ $= 2x^2 - 4x - 1$ $b = -4$	✓ substitution/vervanging ✓ subst (0 ; -1)/verv (0 ; -1) ✓ value of a /waarde van a ✓ value of b /waarde van b	(4)
6.2	$1 - k < 0$ $k > 1$	✓ substitution/vervanging ✓ solution/oplossing	(2)
			[6]

QUESTION 7/VRAAG 7

7.1	$A = P(1+i)^n$ $A = 62\,000(1+0,05)^{20}$ $A = R164\,504,46$		✓ i ✓ substitution/vervangings ✓ answer/antwoord	(3)
7.2	7.2.1	$P_v = \frac{x[1-(1+i)^{-n}]}{i}$ $x = \frac{800\,000 \times \frac{0,11}{12}}{\left[1 - \left(1 + \frac{0,11}{12}\right)^{-240}\right]}$ $x = R8257,51$	✓ i ✓ n ✓ substitution/vervangings	(3)
	7.2.2	$\text{Balance / Balans} = \frac{8257,51 \left[1 - \left(1 + \frac{0,11}{12}\right)^{-60}\right]}{\frac{0,11}{12}}$ $= R379\,787,94$ OR/OF $\text{Balance / Balans} = A - F_v$ $\text{Balance / Balans} = P(1+i)^n - \frac{x[(1+i)^n - 1]}{i}$ $= 800\,000 \left(1 + \frac{0,11}{12}\right)^{180} - \frac{8257,51 \left[\left(1 + \frac{0,11}{12}\right)^{180} - 1\right]}{\frac{0,11}{12}}$ $\text{Balance / Balans} = R379\,786,50$	✓ $n = -60$ ✓ i ✓ substitution/vervangings ✓ answer/antwoord OR/OF ✓ $n = 180$ ✓ substitution A/verv A ✓ substitution F_v /verv F_v ✓ answer/antwoord	(4)

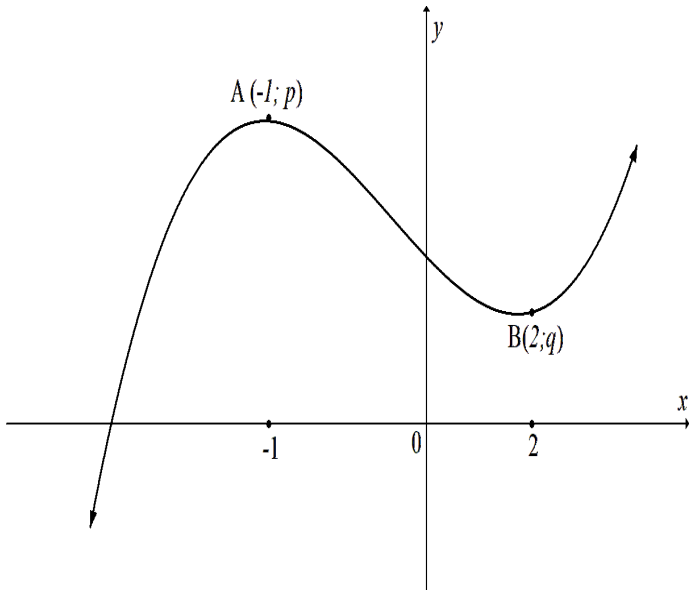
	7.2.3	$P_v = \frac{x[1-(1+i)^{-n}]}{i}$ $800\,000 = \frac{12\,000 \left[1 - \left(1 + \frac{0,11}{12} \right)^{-n} \right]}{\frac{0,11}{12}}$ $n = \frac{\log \left(1 - \frac{800\,000 \times \frac{0,11}{12}}{12\,000} \right)}{-\log \left(1 + \frac{0,11}{12} \right)}$ $n = 103,5$ Period / Periode = 104 months / maande In years / In jare = $\frac{104}{12} \approx 9$ years / jare	✓ substitution P_v / verv P_v ✓ substitution / vervanging ✓ correct use of logs / korrekte gebruik van logs ✓ value of n / waarde van n ✓ answer / antwoord	(5)
				[15]

QUESTION 8/VRAAG 8

8.1	$f(x) = -x^2 + 3x$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{-(x+h)^2 + 3(x+h) - (-x^2 + 3x)}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{-x^2 - 2xh - h^2 + 3x + 3h + x^2 - 3x}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{h(-2x - h + 3)}{h}$ $f'(x) = \lim_{h \rightarrow 0} (-2x - h + 3)$ $f'(x) = -2x + 3$ OR $f(x) = -x^2 + 3x$ $f(x+h) = -(x+h)^2 + 3(x+h)$ $= -x^2 - 2xh - h^2 + 3x + 3h$ $f(x+h) - f(x) = -x^2 - 2xh - h^2 + 3x + 3h + x^2 - 3x$ $= -2xh - h^2 + 3h$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{h(-2x - h + 3)}{h}$ $f'(x) = \lim_{h \rightarrow 0} (-2x - h + 3)$ $f'(x) = -2x + 3$		✓ $f(x+h)$ ✓ substitution/<i>vervang</i> ✓ simplification/<i>vereenvoudig</i> ✓ common factor/<i>gemeensk faktor</i> ✓ answer/<i>antwoord</i>	(5)
8.2	8.2.1	$g(x) = x^2 - 2\sqrt{x}$ $g(x) = x^2 - 2x^{\frac{1}{2}}$ $g'(x) = 2x - x^{-\frac{1}{2}}$	✓ $2x^{\frac{1}{2}}$ ✓ $2x$ ✓ $x^{-\frac{1}{2}}$	(3)

8.2.2	$y = \left[\frac{x^3 - 2x^2 - x + 2}{x - 1} \right]$ $y = \left[\frac{(x-1)(x^2 - x - 2)}{x - 1} \right]$ $y = x^2 - x - 2$ $\frac{dy}{dx} = 2x - 1$	✓ factors/faktore ✓ $2x$ ✓ -1	(3)
			[11]

QUESTION 9/VRAAG 9

9.1		✓ shape/vorm ✓ $A(-1 ; p)$ ✓ $B(2 ; q)$	(3)
9.2	One root/Een wortel	✓ answer/antwoord	(1)

9.3	$f'(x) = 3x^2 + 2xb + c$ $f'(x) = 0$ $3(-1)^2 + 2b(-1) + c = 0$ $3 - 2b + c = 0$ $c = 2b - 3 \dots\dots\dots(1)$ $f'(2) = 0$ $3(2)^2 + 2b(2) + c = 0$ $12 + 4b + c = 0$ $c = -4b - 12 \dots\dots\dots(2)$ $2b - 3 = -4b - 12$ $6b = -9$ $b = -\frac{3}{2}$ $c = -4\left(-\frac{3}{2}\right) - 12$ $\therefore c = -6$	$\checkmark 3x^2 + 2xb + c$ $\checkmark c = 2b - 3$ $\checkmark c = -4b - 12$ $\checkmark 2b - 3 = -4b - 12$ $\checkmark b = -\frac{3}{2}$ $\checkmark c = -6$	(6)
			[10]

QUESTION 10/VRAAG 10

10.1	10.1.1	$p\left(x ; \sqrt{-x^3+8}\right)$ $OP^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2$ $= (x)^2 + \left(\sqrt{-x^3+8}\right)^2$ $= -x^3 + x^2 + 8$ $OP = \sqrt{-x^3 + x^2 + 8}$	✓ substitution/vervanging ✓ answer/antwoord	(2)
	10.1.2	For max / min values $f'(x) = 0$ <i>Vir min / maks waardes $f'(x) = 0$</i> $-3x^2 + 2x = 0$ $x(-3x + 2) = 0$ $x = 0$ or / of $x = \frac{2}{3}$ subst / verv $x = 0$ $y = 8$ subst / verv $x = \frac{2}{3}$ $y = -\left(\frac{2}{3}\right)^3 + \left(\frac{2}{3}\right)$ $= 8,15$ The maximum of OP^2 is 8,15 / <i>Die maksimum van OP^2 is 8,15</i>	✓ $f'(x) = 0$ ✓ both values of x/beide waardes van x ✓ value of y when $x = 0$ / <i>waarde van y as $x = 0$</i> ✓ value of y when $x = \frac{2}{3}$ <i>/waarde van x as $x = \frac{2}{3}$</i> ✓ max value/maks waarde	(5)
	10.1.3	The y – intercept of the graph is $2\sqrt{2}$ and the x – intercept is 2. The minimum value is (2 ; 0) / <i>Die y – afsnit van die grafiek is</i> $2\sqrt{2}$ <i>en die x – afsnit is 2. Die minimum</i> <i>waarde is (2 ; 0).</i> $OP^2 = -x^3 + x^2 + 8$ $= -(2)^3 + (2)^2 + 8$ $= 4$ $OP = \sqrt{4} = 2$	✓ substitution/vervanging ✓ answer/antwoord	(2)

10.2	10.2.1	$A = \frac{1}{2}(PQ + RS)(QR)$ $A(x) = \frac{1}{2}(2x - 3 + 4x + 3)(5 - x)$ $= \frac{1}{2}(6x)(5 - x)$ $= 15x - 3x^2$	✓ substitution/ <i>vervanging</i> ✓ simplification/ <i>vereenvoudig</i>	(2)
	10.2.2	$A'(x) = 0$ $15 - 6x = 0$ $6x = 15$ $x = 2.5 \text{ m}$	✓ derivative = 0/ <i>afgeleide = 0</i> ✓ answer/ <i>antwoord</i>	(2)
	10.2.3	Maximum Area / <i>Maksimum Opv</i> $= 15(2.5) - 3(2.5)^2$ $= 18.75 \text{ m}^2$	✓ substitution/ <i>vervanging</i> ✓ answer/ <i>antwoord</i>	(2)
				[15]

QUESTION 11/VRAAG 11

11.1	11.1.1	$a = 720$ $b = 120$ $c = 180$ $d = 540$ $e = 180$ $f = 240$	✓ any two/ <i>enige twee</i> ✓ any two/ <i>enige twee</i> ✓ any two/ <i>enige twee</i>	(3)
	11.1.2	$P(\text{Good Eng}) \times P(\text{Good Maths})$ $= \frac{480}{720} \times \frac{540}{720}$ $= 0,5$ $P(\text{Good English and Good Maths})$ $= \frac{360}{720}$ $= 0,5$ So it seems that the good English is independent of maths ability / <i>Dit lyk dat goeie Engels onafhanklik is van wiskundige vaardigheid</i>	$\frac{480}{720} \times \frac{540}{720}$ ✓ ✓ answer/ <i>antwoord</i> $\frac{360}{720}$ ✓ ✓ answer/ <i>antwoord</i>	(4)
11.2	$B \rightarrow \text{Beach/strand}$ $S \rightarrow \text{Sunny/sonnig}$ <pre>graph LR Root(()) --- 1/3 S((S)) Root --- 2/3 nS((nS)) S --- 5/8 SB((SB)) S --- 3/8 SnB((SnB)) nS --- 2/8 nSB((nSB)) nS --- 6/8 nSnB((nSnB))</pre>			

		$P(SB) + P(nSB)$ $= \left(\frac{1}{3} \times \frac{5}{8}\right) + \left(\frac{2}{3} \times \frac{2}{8}\right)$ $= \frac{5}{24} + \frac{4}{24}$ $= \frac{9}{24}$	$\checkmark \left(\frac{1}{3} \times \frac{5}{8}\right)$ $\checkmark \left(\frac{2}{3} \times \frac{2}{8}\right)$ $\checkmark \text{ answer/antwoord}$	(3)
11.3	11.3.1	$P = \frac{4 \times 3 \times 2 \times 24}{5040}$ $= \frac{576}{5040} = \frac{4}{35}$	$\checkmark 7! = 5040$ $\checkmark 4 \times 3 \times 2 \times 24 = 576$ $\checkmark \text{ answer/antwoord}$	(3)
	11.3.2	$P = \frac{6 \times 4 \times 24}{5040}$ $= \frac{576}{5040} = \frac{4}{35}$ Both events have the same probability/Beide gebeurtenisse het dieselfde waarskynlikheid	$\checkmark 6 \times 4 \times 24 = 576$ $\checkmark \text{ answer/antwoord}$ $\checkmark \text{ conclusion/gevolgtrekking}$	(3)
				[16]

TOTAL/ TOTAAL: 150



education

**MPUMALANGA PROVINCE
REPUBLIC OF SOUTH AFRICA**

**NATIONAL
SENIOR CERTIFICATE
NASIONALE
SENIOR SERTIFIKAAT**

GRADE 12/GRAAD 12

**MATHEMATICS P1/WISKUNDE V1
SEPTEMBER 2026
MARKING GUIDELINE/NASIENRIGLYNE**

MARKS/PUNTE: 150

The marking guideline consists of 10 pages/Die nasienriglyn bestaan uit 10 bladsye.

TAKE NOTE:

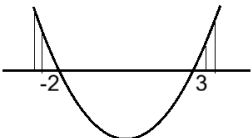
- If a candidate answered a question TWICE, mark only the FIRST attempt.
- If a candidate crossed out an answer and did not redo it, mark the crossed-out answer.
- Consistent accuracy applies to ALL aspects of the marking guidelines.
- Assuming values/answers in order to solve a problem is unacceptable.

LET WEL:

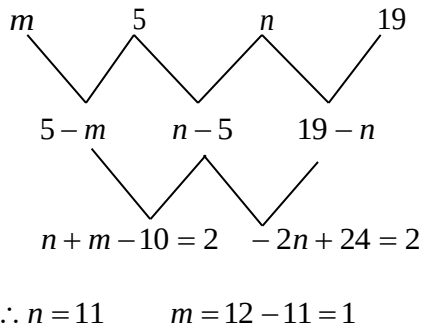
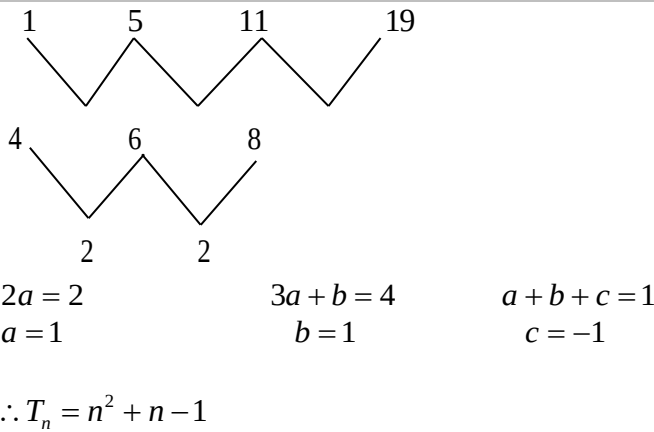
- As 'n kandidaat 'n vraag TWEE keer beantwoord het, sien slegs die EERSTE poging na.
- As 'n kandidaat 'n antwoord deurgehaal en nie oorgedoen het nie, sien die deurgehaalde antwoord na.
- Volgehoue akkuraatheid is op ALLE aspekte van die nasienriglyn van toepassing.
- Dit is onaanvaarbaar om waardes/antwoorde te veronderstel om 'n probleem op te los.

QUESTION 1/VRAAG 1

1.1.1	$(2x+5)(x-1)=0$ $x = -\frac{5}{2}$ or $x = 1$	✓✓ answers (2)
1.1.2	$-3x^2 - 4x + 5 = 0$ $x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(-3)(5)}}{2(-3)}$ $x = -2,12$ and $x = 0,79$	✓ standard form ✓ substitution ✓✓ answers (4)
1.1.3	$3^{2x} - 3^x - 6 = 0$ $(3^x - 3)(3^x + 2) = 0$ $(3^x - 3) = 0$ or $(3^x + 2) = 0$ $3^x = 3$ or $3^x \neq -2$ $x = 1$ No Sol OR/OF Let $3^x = k$ $k^x - k - 6 = 0$ $(k-3)(k+2) = 0$ $k = 3$ or $k = -2$ $3^x = 3$ or $3^x \neq -2$ $\therefore x = 1$	✓ breaking to prime factors ✓ factoring ✓✓ solutions with rejection (4)
1.1.4	$(2^5)^{\frac{1}{3}} = (2^3)^{3x} \cdot 2^{6x}$ $2^{\frac{5}{3}} = 2^{9x} \cdot 2^{6x}$	✓ exponential form

	$2^{\frac{5}{3}} = 2^{15x}$ $\frac{5}{3} = 15x$ $x = \frac{1}{9}$	✓ adding exponents ✓ answer (3)
1.1.5	$-(x+2)(x-3) \leq 0$ $x = -2$ and $x = 3$ are critical values $x \leq -2$ or $x \geq 3$ 	✓ critical values ✓✓ $x \leq -2$ or $x \geq 3$ (3)
1.2	$y = 2 + x$ $2 + x - 2 = (x - 2)^2$ $2 + x - 2 = (x^2 - 4x + 4)$ $x = x^2 - 4x + 4$ $x^2 - 5x + 4 = 0$ $(x - 1)(x - 4) = 0$ $x = 1$ or $x = 4$ $y = 4 + 2$ or $y = 1 + 2$ $y = 6$ or $y = 3$	✓ $y = 2 + x$ ✓ substitution ✓ factors ✓ both values of x ✓ both values of y (5)
1.3	$3x^2 + (2k - 2)x - k = 0$ $\Delta = b^2 - 4ac$ $= (2k - 2)^2 - 4(3)(-k)$ $= 4k^2 + 4k + 4$ $k = \frac{-4 \pm \sqrt{(4)^2 - 4(4)(4)}}{2(4)}$ produces non-real solutions $\therefore$ There's no real value of k for which the discriminant can be equal to zero. Roots are non-real and are never equal.	✓ substitution $\checkmark = 4k^2 + 4k + 4$ $\checkmark k = \frac{-4 \pm \sqrt{(4)^2 - 4(4)(4)}}{2(4)}$ ✓ mathematical rational (4)
1.4	$\frac{5^{2006} - 5^{2004} + 24}{5^{2004} + 1}$ $= \frac{5^{2004}(5^2 - 1) + 24}{5^{2004} + 1}$ $= \frac{5^{2004}(24) + 24}{5^{2004} + 1}$ $= \frac{24(5^{2004} + 1)}{5^{2004} + 1}$ $= 24$	✓ common factor/ gemeenskaplike faktor ✓ common factor/ gemeenskaplike faktor ✓ answer/ antwoord (3)
		[28]

QUESTION 2/VRAAG 2

2.1.1	14	✓ answer (1)
2.1.2	$T_n = a + d(n-1)$ $= -2 + 4(n-1)$ $= 4n - 6$	✓ substitution ✓ answer (2)
2.1.3	$262 = 4n - 6$ $n = 67$ $S_n = \frac{67}{2} [2(-2) + 4(67-1)]$ $= 8\,710$	✓ equating to 262 ✓ n-value ✓ substitution ✓ answer (4)
2.2.1	 $n + m - 10 = 2$ $-2n + 24 = 2$ $\therefore n = 11$ $m = 12 - 11 = 1$	✓ second difference ✓ equating to 2 ✓ n-value ✓ m-value (4)
2.2.2	 $2a = 2$ $3a + b = 4$ $a + b + c = 1$ $a = 1$ $b = 1$ $c = -1$ $\therefore T_n = n^2 + n - 1$	✓ value of a and b ✓ value of c ✓ $T_n = n^2 + n - 1$ (3)
		[14]

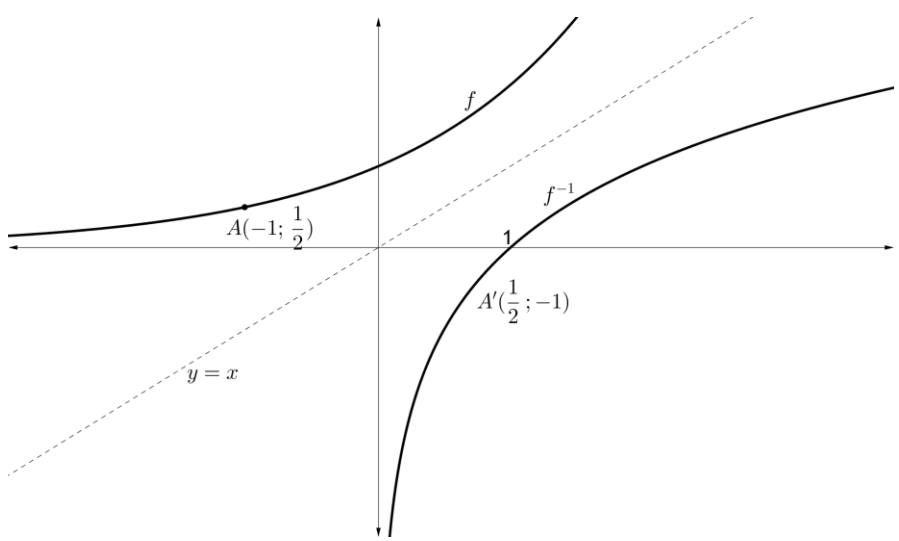
QUESTION 3/VRAAG 3																				
3.1.1	$r = -2$			✓ answer (1)																
3.1.2	No, for convergence $-1 < r < 1$, this is not the case here.			✓No ✓condition (2)																
3.1.3	$n = 21 - 3 + 1 = 19$ $S_{19} = \frac{-8x[(-2)^{19} - 1]}{-2 - 1}$ $= -1398104 x$			✓n- value ✓substitution ✓answer (3)																
3.2.1	<table border="1"><thead><tr><th>TERM</th><th>INCOME</th><th>EXPENSES</th><th>SAVINGS</th></tr></thead><tbody><tr><td>1</td><td>R150 000</td><td>R105 000</td><td>R45 000</td></tr><tr><td>2</td><td>R1635 00</td><td>R122 000</td><td>R41500</td></tr><tr><td>3</td><td>R177 000</td><td>R139 000</td><td>R38 000</td></tr></tbody></table> Savings series is $R45\,000 + R41500 + R38\,000 = \dots + 0$			TERM	INCOME	EXPENSES	SAVINGS	1	R150 000	R105 000	R45 000	2	R1635 00	R122 000	R41500	3	R177 000	R139 000	R38 000	✓income ✓expenses ✓savings ✓savings series (4)
TERM	INCOME	EXPENSES	SAVINGS																	
1	R150 000	R105 000	R45 000																	
2	R1635 00	R122 000	R41500																	
3	R177 000	R139 000	R38 000																	
3.2.2	Income = $150\,000 + 13\,000(n - 1)$ Expenses = $105\,000 + 17\,000(n - 1)$ To be left with nothing means INCOME = EXPENSES $150\,000 + 13\,000(n - 1) = 105\,000 + 17\,000(n - 1)$ $\therefore n = 13,85 / n = 14$ years OR/OF $0 = 45\,000 - 3500(n - 1)$ $\frac{45000}{3500} = n - 1$ $\therefore n = 13,85 / n = 14$ years			✓Income and Expenses formulae ✓equating ✓answer OR/OF ✓equation ✓simplification ✓answer (3)																
				[13]																

QUESTION 4/VRAAG 4

4.1	$y = \frac{a}{x-1} + 2$ $0 = \frac{a}{0-1} + 2 \quad 0 = -a + 2$ $a = 2$ $y = \frac{2}{x-1} + 2$	✓ substitution of asymptotes ✓ substituting a point (0; 0) ✓ value of a ✓ equation (4)
4.2	$0 = \left(\frac{5}{2} - 1\right)^2 + q$ $q = -\frac{9}{4}$	✓ substitution of x and y ✓ q - value (2)

4.3	$x = 2$ $y = -1$	✓ $x = 2$ ✓ $y = -1$ (2)
4.4	$L\left(-\frac{1}{2}; 0\right)$, Symmetry $LQ = \frac{5}{2} - \left(-\frac{1}{2}\right) = 3 \text{ units}$	✓ x-coordinate of L ✓ length (2)
4.5	$h(x) = -(x-1)^2 + \frac{9}{4}$	✓ answer (1)
4.6	$x \in (-\infty; 0) \cup (1; \infty)$ OR /OF $x < 0$ or $x > 1$	✓ 1 st Interval ✓ 2 nd Interval (2)
		[13]

QUESTION 5/VRAAG 5

5.1	$x = 2^y$ $\therefore y = \log_2 x$	✓ interchanging x & y ✓ answer (2)
5.2	$A'\left(\frac{1}{2}; -1\right)$	✓ answer
5.3		✓ shape ✓ x – intercept ✓ symmetry – axis ✓ another point (4)
5.4	$2^x = \left(\frac{1}{2}\right)^{x-1}$ $2^x = 2^{-x+1}$ $x = -x+1$ $x = \frac{1}{2}; y = \sqrt{2}$	✓ equating ✓ exponential laws ✓ x - coordinate ✓ y - coordinate (4)
		[11]

QUESTION 6/VRAAG 6

6.1.1	$A = P(1 + in)$ $x = R15000(1 + 0,075 \times 5)$ $x = R20625$	✓ substitution into linear formula ✓ answer (2)
6.1.2	$A = P(1 + i)^n$ $R20625 = R10000(1 + i)^5$ $\frac{R20625}{R10000} = (1 + i)^5$ $\sqrt[5]{\frac{R20625}{R10000}} - 1 = i$ $\therefore i = 15,58\%$	✓ substitution of A and P ✓ $n = 5$ ✓ simplification ✓ answer (4)
6.2.1	$R20625 \times 2 = R41250$	✓ answer (1)
6.2.2	$R70000 - R41250 = R28750$	✓ answer (1)
6.2.3	$R28750 = \frac{x \left[\left(1 + \frac{0,11}{12} \right)^{5 \times 12} - 1 \right]}{\frac{0,11}{12}}$ $x = R361,55$	✓ substitution into F correctly ✓ $i = \frac{0,11}{12}$ ✓ $n = 60$ ✓ answer (4)
6.3.	$OB = \frac{588,32 \left[1 - \left(1 + \frac{0,13}{12} \right)^{-1,5 \times 12} \right]}{\frac{0,13}{12}}$ $OB = R9574,34$ OR $OB = 15000 \left(1 + \frac{0,13}{12} \right)^{12} - \frac{588,32 \left[\left(1 + \frac{0,13}{12} \right)^{12} - 1 \right]}{\frac{0,13}{12}}$ $OB = R9574,34$	✓ substitution ✓ $n = 18$ ✓ answer (3) OR/OF ✓ substitution ✓ $n = 12$ ✓ answer (3)
		[15]

QUESTION 7/VRAAG 7		
7.1	$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{-\pi(x+h)^2 - (-\pi x^2)}{h}$ $= \lim_{h \rightarrow 0} \frac{-\pi(x^2 + 2xh + h^2) + \pi x^2}{h}$ $= \lim_{h \rightarrow 0} \frac{-\pi x^2 - 2\pi xh - \pi h^2 + \pi x^2}{h}$ $= \lim_{h \rightarrow 0} \frac{-2\pi xh - \pi h^2}{h}$ $= \lim_{h \rightarrow 0} \frac{h(-2\pi x - \pi h)}{h}$ $= \lim_{h \rightarrow 0} -2\pi x - \pi h$ $= -2\pi x$	✓ substitute $f(x+h)$ ✓ correct substitution into formula and notation ✓ simplification ✓ factorisation ✓ answer (5)
7.2	$y = (1 - \sqrt{x})(1 - \sqrt{x})$ $= 1 - 2\sqrt{x} + x$ $= 1 - 2x^{\frac{1}{2}} + x$ $\frac{dy}{dx} = -x^{-\frac{1}{2}} + 1$	✓ expansion ✓ writing in exponent form ✓ answer (3)
7.3	$g(x) = \frac{x(x^2 - 100) - x^2 + 100}{x - 1}$ $= \frac{x(x^2 - 100) - (x^2 - 100)}{x - 1}$ $= \frac{(x - 1)(x^2 - 100)}{x - 1}$ $= x^2 - 100$ $g'(x) = 2x$	✓ common negative ✓ taking out common bracket ✓ simplification ✓ answer (4)
7.4	$h(x) = 7 - 2x^{-3}$ $h'(x) = 6x^{-4}$ $h'(2) + 4 = 6(2)^{-4} + 4$ $= \frac{35}{8}$	✓ $h'(x) = 6x^{-4}$ ✓ substitution ✓ answer (3)
		[15]

QUESTION 8/VRAAG 8

8.1	$y = a(x - R_1)(x - R_2)(x - R_3)$ $y = -1(x + 1)^2(x - 2)$ $= -x^3 + 3x + 2$	$\checkmark a = -1$ $\checkmark y = -1(x + 1)^2(x - 2)$ $\checkmark$ expansion (3)
8.2	$f'(x) = 0$ $f'(x) = -3x^2 + 3$ $3x^2 = 3$ $x = \pm 1$ $f(1) = -(1)^3 + 3(1) + 2 = 4$ $C(1; 4)$	$\checkmark f'(x) = 0$ $\checkmark f'(x) = -3x^2 + 3$ $\checkmark$ x-values $\checkmark$ coordinates of C (4)
8.3	$-3x^2 + 3 = -9$ $-3x^2 = -12$ $x = \pm 2$ $-(2)^3 + 3(2) + 2 = 0$ $\therefore (2; 0)$ is the point of tangency	$\checkmark f'(x) = -9$ $\checkmark$ substitution of 2 $\checkmark$ answer (3)
8.4	$C'(4; 4)$	$\checkmark$ answer (1)
8.5	$x \in (-\infty; -1) \cup (1; 2)$ OR $x < -1$ or $1 < x < 2$	$\checkmark$ 1 st interval $\checkmark$ 2 nd interval (2)
8.6	$k \in (-\infty; 0) \cup (4; \infty)$ OR $x < 0$ or $x > 4$	$\checkmark$ 1 st interval $\checkmark$ 2 nd interval (2)
		[15]

QUESTION 9/VRAAG 9

9.1	After t hours, $BF = 20t$ and $CD = 35t$ $\therefore BC = 80 - 35t$ $FC = \sqrt{(20t)^2 + (80 - 35t)^2}$ $= \sqrt{400t^2 + 6400 - 5600t + 1225t^2}$ $= \sqrt{1625t^2 - 5600t + 6400}$	$\checkmark BF = 20t$ and $CD = 35t$ $\checkmark BC = 80 - 35t$ $\checkmark$ substitution $\checkmark$ simplification (4)
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9.2	Closest means minimum distance between the two. FC is minimum if FC^2 is minimum. $FC^2 = 1625t^2 - 5600t + 640$ $\frac{dFC^2}{dt} = 3250t - 5600$ $3250t - 5600 = 0, \text{ for minimum distance}$ $\therefore t = \frac{5600}{3250} = 1,72 \text{ hrs}$	✓ $FC^2 = 1625t^2 - 5600t + 640$ ✓ $\frac{dFC^2}{dt}$ ✓ equating to 0 ✓ answer (4)
9.3	$FC = \sqrt{1625(1.72)^2 - 5600(1.72) + 6400}$ $= 39,69 \text{ km apart}$	✓ substitution ✓ answer (2)
		[10]

QUESTION 10/VRAAG 10

10.1	$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$ $0,7 = 0,4 + k - P(A \text{ and } B)$ $\therefore P(A \text{ and } B) = k - 0,3$ For independent events: $P(A \text{ and } B) = P(A) \times P(B)$ $k - 0,3 = 0,4 \times k$ $k = 0,5$	✓ substitution into addition rule ✓ $P(A \text{ and } B) = k - 0,3$ ✓ substitution into $P(A \text{ and } B) = P(A) \times P(B)$ ✓ answer (4)
10.2.1	$7! = 5040$	✓ $7!$ ✓ answer (2)
10.2.2	$3! \times 5! = 720$	✓ $3!$ ✓ $5!$ ✓ 720 (3)
10.3.1	$\underline{3} \times \underline{9} \times \underline{9} \times \underline{4} = 972$	✓ <u>3</u> in first position ✓ <u>4</u> in last position ✓ 9×9 (3)
10.3.2	$9 \times 9 \times 9 \times 9 = 6561$ Total sample space) $9 \times 9 \times 9 \times 1 = 729$ (number of passwords divisible by 5) $P(\text{Multiple of 5}) = \frac{729}{6561} = 0.11$	✓ total sample space ✓ number of passwords divisible by 5 ✓ ✓ answer (4)
		[16]

TOTAL / TOTAAL: 150



Northern Cape Department of Education

**PROVINCIAL PREPARATORY EXAMINATION/
*PROVINSIALE VOORBEREIDENDE EKSAMEN***

GRADE/*GRAAD* 12

MATHEMATICS/*WISKUNDE*

PAPER/*VRAESTEL* 1

SEPTEMBER 2026

MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS/*PUNTE*: 150

**These marking guidelines consist of 20 pages./
*Hierdie nasienriglyne bestaan uit 20 bladsye.***

MARKING CODES/NASIENKODES	
A	Accuracy/Akkuraatheid
CA	Consistent accuracy/Volgehoue akkuraatheid
M	Method/Metode
R	Rounding/Afronding
NPR	No penalty for rounding/Geen penalisering vir afronding nie
NPU	No penalty for units omitted/Geen penalisering vir eenhede weggelaat nie
S	Simplification/Vereenvoudiging
SF	Substitution in correct formula/Vervanging in korrekte formule

NOTE

- If a learner answers a question TWICE, only mark the FIRST attempt.
- If a learner has crossed out an attempt to answer a question but did not redo it, mark the crossed-out version
- Consistent accuracy applies in ALL aspects of the marking guidelines.
- Assuming answers/values to solve a problem is UNACCEPTABLE.

NOTA

- As 'n leerder 'n vraag TWEE KEER beantwoord, sien slegs die EERSTE poging na.
- As 'n leerder 'n antwoord van 'n vraag doodtrek en nie oordoen nie, sien die doodtrekte poging na.
- Volgehoue akkuraatheid word in ALLE aspekte van die nasienriglyne toegepas.
- Om antwoorde/waardes aan te neem om 'n problem op te los, is OnAANVAARBAAR.

1.2	$y - x^2 = -3x + 2 \dots(1)$ and/en $y = 2x - 4 \dots(2)$ (2) into (1) $(2x - 4) - x^2 = -3x + 2$ $-x^2 + 2x - 4 = -3x + 2$ $-x^2 + 5x - 6 = 0$ $x^2 - 5x + 6 = 0$ $(x - 2)(x - 3) = 0$ $\therefore x = 2 \text{ OR/OR } x = 3$ $y = 2(2) - 4 \text{ OR/OR } y = 2(3) - 4$ $y = 0 \qquad \qquad \qquad y = 2$ OR/OR $y = -3x + 2 + x^2 \dots(1)$ and/en $y = 2x - 4 \dots(2)$ (2) into (1) $-3x + 2 + x^2 = 2x - 4$ $x^2 - 3x - 2x + 4 + 2 = 0$ $x^2 - 5x + 6 = 0$ $x^2 - 5x + 6 = 0$ $(x - 2)(x - 3) = 0$ $\therefore x = 2 \text{ OR/OR } x = 3$ $y = 2(2) - 4 \text{ OR/OR } y = 2(3) - 4$ $y = 0 \qquad \qquad \qquad y = 2$	✓substitution ✓standard form ✓factors ✓BOTH x-values ✓BOTH y-values OR/OR ✓substitution ✓standard form ✓factors ✓BOTH x-values ✓BOTH y-values (5)
-----	--	--

1.3	$b^2 - 4ac = 0$ $(-m)^2 - 4(2)(2) = 0$ $m^2 - 16 = 0$ $m = \pm 4$ The equal root is $x = \frac{-b}{2a} = \frac{m}{4}$ $x^2 - (m - 2)x + k = 0$ has equal roots that are reciprocals of the equal root. $\left(x - \frac{4}{m}\right)^2 = 0.$ $x^2 - \frac{8}{m}x + \frac{16}{m^2} = 0.$ Comparing with $x^2 - (m - 2)x + k = 0$ Hence $m - 2 = \frac{8}{m} \text{ and } k = \frac{16}{m^2}$ $m(m - 2) = 8$ $m^2 - 2m - 8 = 0$ $(m - 4)(m + 2) = 0$ $m = 4 \text{ or } m \neq -2$ since $m = \pm 4$ from the first eq. $k = \frac{16}{m^2} = \frac{16}{4^2} = \frac{16}{16} = 1.$ $\therefore m = 4, k = 1$	✓ $m = \pm 4$ ✓ $x = \frac{m}{4}$ ✓ reciprocal $\frac{4}{m}$ ✓ expansion ✓ equation ✓ choose $m = 4$ ✓ $k = 1$ (7)
[25]		

QUESTION 2/VRAAG 2		
2.1	$T_1 = 5$ Therefore, the next two terms are: $T_2 = T_1 + 6(1) + 2$ $T_2 = 5 + 8$ $T_2 = 13$ $T_3 = T_2 + 6(2) + 2$ $T_3 = 13 + 14$ $T_3 = 27$	$\checkmark T_2 = 13$ $\checkmark T_3 = 27$ (2)
2.2	$2a = 6$ $a = 3$ $3a + b = 8$ $3(3) + b = 8$ $b = -1$ $a + b + c = 5$ $3 - 1 + c = 5$ $c = 3$ $\therefore T_n = 3n^2 - n + 3$	$\checkmark 2a = 6$ $\checkmark 3(3) + b = 8$ $\checkmark 3 - 1 + c = 5$ (3)
2.3	$3n^2 - n + 3 = 2327$ $3n^2 - n - 2324 = 0$ $n = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(3)(-2324)}}{2(3)}$ $n = 28$ OR/OF $n \neq -27,66$ $\therefore n = 29$	$\checkmark$ standard form $\checkmark$ SF $\checkmark n = 28$ $\checkmark n = 29$ AO (4)
2.4	$6p + 2 = 902$ $6p = 900$ $p = 150$ Therefore, the consecutive terms are T_{150} and T_{151}	$\checkmark$ M $\checkmark$ answer (2)
[11]		

QUESTION 3/VRAAG 3		
3.1.1	$r = \frac{6}{20} \times \frac{10}{6} = \frac{1}{2}$ $S_{18} = \frac{\frac{6}{10} \left(\left(\frac{1}{2} \right)^{18} - 1 \right)}{\frac{1}{2} - 1}$ $= 1,20$ OR/OF $r = \frac{6}{20} \times \frac{10}{6} = \frac{1}{2}$ $S_{18} = \frac{\frac{6}{10} \left(1 - \left(\frac{1}{2} \right)^{18} \right)}{1 - \frac{1}{2}}$ $= 1,20$	$\checkmark r = \frac{1}{2}$ $\checkmark$ SF $\checkmark$ answer OR/OF $\checkmark r = \frac{1}{2}$ $\checkmark$ SF $\checkmark$ answer (3)
3.1.2	$\frac{6}{10} \left(\frac{1}{2} \right)^{n-1} = \frac{6}{4096}$ $\left(\frac{1}{2} \right)^{n-1} = \frac{5}{2048}$ $n - 1 = \log_{\frac{1}{2}} \frac{5}{2048}$ $n = 9,67$ $\therefore n = 9$	$\checkmark$ Equation $\checkmark$ S $\checkmark$ log $\checkmark n = 9$ (4)
3.2	$T_1 = 5 \left(\frac{1}{3} \right)^1 = \frac{5}{3}$ $T_2 = 5 \left(\frac{1}{3} \right)^2 = \frac{5}{9}$ $r = \frac{\frac{5}{9}}{\frac{5}{3}} = \frac{1}{3}$ $-1 < \frac{1}{3} < 1$ Therefore $T_n = 5 \left(\frac{1}{3} \right)^n$ converges	$\checkmark r = 1/3$ $\checkmark -1 < \frac{1}{3} < 1$ (2)

3.3	$\sum_{k=p}^{\infty} 5 \left(\frac{1}{3} \right)^k = \frac{5}{18},$ $\frac{a}{1 - \frac{1}{3}} = \frac{5}{18}$ $a = \frac{5}{18} \times \frac{2}{3}$ $a = \frac{5}{27}$ $5 \left(\frac{1}{3} \right)^p = \frac{5}{27}$ $\left(\frac{1}{3} \right)^p = \left(\frac{1}{3} \right)^3 \quad \text{OR/OF} \quad p = \log_{\frac{1}{3}} \frac{1}{27}$ $\therefore p = 3$	✓SF ✓ $a = \frac{5}{27}$ ✓ $T_1 = a$ ✓ same base or log ✓ $p = 3$ (5)
[14]		

QUESTION 4/VRAAG 4		
4.1	$A(-1; 0)$ $B(3; 0)$	$\checkmark A(-1; 0)$ $\checkmark B(3; 0)$ (2)
4.2	$y = x^2 - 2x - 3$ $x = -\frac{(-2)}{2(1)} = 1$ $y = 1^2 - 2(1) - 3 = -4$ $\therefore C(1; -4)$ OR/OF $y = x^2 - 2x - 3$ $= x^2 - 2x + \left(\frac{2}{2}\right)^2 - \left(\frac{2}{2}\right)^2 - 3$ $= x^2 - 2x + 1 - 1 - 3$ $= (x - 1)^2 - 4$ $\therefore C(1; -4)$ OR/OF $y = x^2 - 2x - 3$ $0 = 2x - 2$ $x = \frac{2}{2}$ $x = 1$ $y = 1^2 - 2(1) - 3 = -4$ $\therefore C(1; -4)$ OR/OF $x = \frac{-1+3}{2}$ $= 1$ $y = (1 + 1)(1 - 3) = -4$ $\therefore C(1; -4)$	$\checkmark$ Expansion $\checkmark x = 1$ $\checkmark y = -4$ OR/OF $\checkmark$ Completing the square $\checkmark x = 1$ $\checkmark y = -4$ OR/OF $\checkmark 1^{\text{st}}$ derivative = 0 $\checkmark x = 1$ $\checkmark y = -4$ OR/OF $\checkmark$ Midpoint of roots $\checkmark x = 1$ $\checkmark y = -4$ (3)
4.3	$p = 3$ Subst. $D\left(\frac{5}{2}; 0\right)$ $0 = -\frac{1}{\frac{5}{2}-3} + q$ $q = -2$ $\therefore f(x) = -\frac{1}{x-3} - 2$	$\checkmark p = 3$ $\checkmark$ SF $\checkmark q = -2$ (3)

4.4	$y = -2$	✓ (1)
4.5	$x > 3 ; x \in \mathbb{R}$ OR/OF $x \in (3; \infty)$	✓✓ $x > 3$ (2)
4.6	$h(x) = g(x) - 5$ $= x^2 - 2x - 3 - 5$ $= x^2 - 2x - 8$	✓SF ✓answer (2)
4.7	$y = (1)^2 - 2(1) - 8 = -9$ $y \geq -9; y \in \mathbb{R}$ OR/OF $y \in [-9; \infty)$	✓ -9 ✓answer (2)
4.8	$EC = f(1) - g(1)$ $= \left(-\frac{1}{1-3} - 2\right) - (1+1)(1-3)$ $= -\frac{3}{2} - (-4)$ $= \frac{5}{2}$ units OR/OF $EC = \sqrt{(1-1)^2 + \left(-\frac{3}{2} - (-4)\right)^2} = \frac{5}{2}$ units	✓ $f(1)$ ✓ $g(1)$ ✓ $\frac{5}{2}$ units OR/OF ✓✓SF ✓ $\frac{5}{2}$ units (3)
4.9	$0 = x^2 - 2x - 8 - p$ $\Delta \geq 0$ $(-2)^2 - 4(1)(-8-p) \geq 0$ $4 + 32 + 4p \geq 0$ $p \geq -\frac{32}{4}$ $p \geq -9$	✓standard form ✓ $\Delta \geq 0$ ✓ $p \geq -9$ AO (3)
[21]		

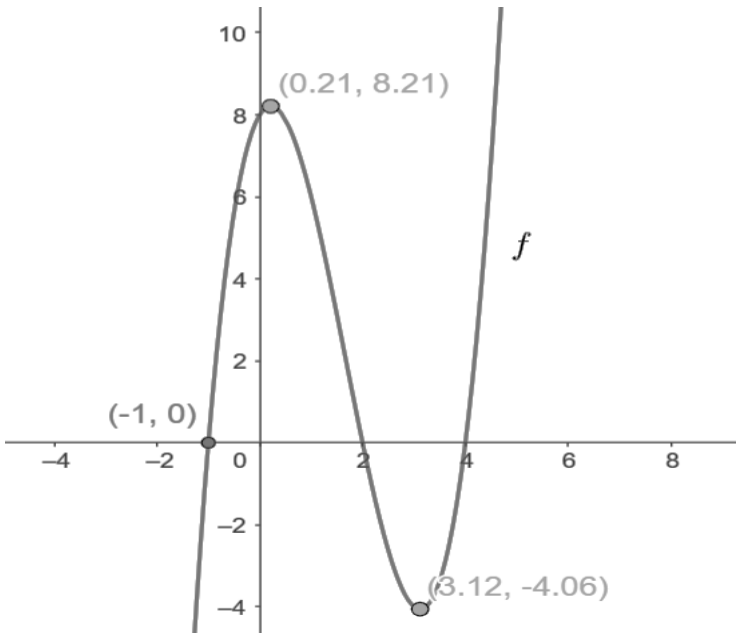
QUESTION 5/VRAAG 5		
5.1	decreasing	✓answer (1)
5.2	$x = 3^{-y}$ $-y = \log_3 x$ $y = -\log_3 x$ OR/OF $x = \left(\frac{1}{3}\right)^y$ $y = \log_{\frac{1}{3}} x$	✓swop x and y ✓ $y = -\log_3 x$ OR/OF ✓swop x and y ✓ $y = \log_{\frac{1}{3}} x$ OR/OF ✓✓ AO (2)
5.3	$m'\left(\frac{1}{9}; 2\right)$	✓answer (1)
5.4		p ✓y-intercept ✓shape p^{-1} ✓x-intercept ✓shape (4)
5.5	$x > 0; x \in \mathbb{R}$ OR/OF $x \in (0; \infty)$	✓answer (1)
5.6	$y = -2$	✓answer (1)
5.7	p is reflected over the $y = x$ line to produce $y = p^{-1}$ p^{-1} is then reflected over $y = 0$ to produce $y = \log_3 x$ OR/OF p is then reflected over $x = 0$ to produce $y = 3^x$ p^{-1} is reflected over the $y = x$ line to produce $y = \log_3 x$	✓reflection on $y = x$ ✓reflection on $y = 0$ OR/OF ✓reflection on $x = 0$ ✓reflection on $y = x$ (2)
[12]		

QUESTION 6/VRAAG 6		
6.1.1	$A = P(1 + i)^n$ $= 185\,000(1 + 0,062)^5$ $= R249\,916,14$	✓SF ✓answer (2)
6.1.2	$A = P(1 - in)$ $= 185\,000(1 - 0,085(5))$ $= R106\,375,00$	✓SF ✓answer (2)
6.1.3	sinking fund = $R249\,916,14 - R106\,375,00$ $= R143\,541,14$ $\frac{x \left(\left(1 + \frac{0,081}{12} \right)^{5(12)} - 1 \right)}{\frac{0,081}{12}} = R143\,541,14$ $x = R1\,988,61$	✓sinking fund ✓i and n ✓SF ✓answer (4)
6.2.1	$\frac{x \left(1 - \left(1 + \frac{0,12}{12} \right)^{-(5(12))} \right)}{\frac{0,12}{12}} = R180\,000$ $x = R4\,004$	✓SF ✓answer (2)
6.2.2	$B = \frac{4004 \left(1 - \left(1 + \frac{0,12}{12} \right)^{-(4(12))} \right)}{\frac{0,12}{12}}$ $B = R152\,047,73$ $A = P(1 + i)^n$ $= 152\,036,34 \left(1 + \frac{0,12}{12} \right)^3$ $= R156\,654,93$ $\frac{x \left(1 - \left(1 + \frac{0,12}{12} \right)^{-45} \right)}{\frac{0,12}{12}} = R156\,654,93$ $x = R4\,340,13$ OR/OF $B = 180\,000 \left(1 + \frac{0,12}{12} \right)^{12} - 4004 \left(\frac{\left(1 + \frac{0,12}{12} \right)^{12} - 1}{\frac{0,12}{12}} \right)$ $B = 152\,047,76$ $A = P(1 + i)^n$ $= 152\,051,57 \left(1 + \frac{0,12}{12} \right)^3$ $\approx R156\,654,96$ $\frac{x \left(1 - \left(1 + \frac{0,12}{12} \right)^{-45} \right)}{\frac{0,12}{12}} = R156\,658,88$ $x = R4\,340,13$	✓i and n ✓SF ✓B ✓A ✓SF ✓x OR/OF ✓i and n ✓SF ✓B ✓A ✓SF ✓x (6)
[16]		

QUESTION 7/VRAAG 7		
NB penalise once for notation in 7.1 ONLY		
7.1	$f(x) = x^2 - 3x + 2$ $f(x+h) = (x+h)^2 - 3(x+h) + 2$ $= x^2 + 2xh + h^2 - 3x - 3h + 2$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{x^2 + 2xh + h^2 - 3x - 3h + 2 - (x^2 - 3x + 2)}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{2xh + h^2 - 3h}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{h(2x + h - 3)}{h}$ $f'(x) = \lim_{h \rightarrow 0} 2x + h - 3$ $f'(x) = 2x - 3$	$\checkmark f(x+h)$ $\checkmark$ SF $\checkmark$ S $\lim_{h \rightarrow 0} \frac{2xh + h^2 - 3h}{h}$ $\checkmark$ S $\lim_{h \rightarrow 0} \frac{h(2x + h - 3)}{h}$ $\checkmark$ S $\lim_{h \rightarrow 0} 2x + h - 3$ $\checkmark 2x - 3$ (6)
7.2.1	$D_x[(2x+5)(x-2)]$ $= D_x[2x^2 + x - 10]$ $= 4x + 1$	$\checkmark$ S $\checkmark 4x$ $\checkmark 1$ (3)
7.2.2	$y = \frac{\sqrt[3]{x^4}}{x} + \frac{2\pi}{x} - \frac{x^{-3}}{x}$ $y = x^{\frac{1}{3}} + 2\pi x^{-1} - x^{-4}$ $\frac{dy}{dx} = \frac{1}{3}x^{-\frac{2}{3}} - 2\pi x^{-2} + 4x^{-5}$	$\checkmark$ S $\checkmark \frac{1}{3}x^{-\frac{2}{3}}$ $\checkmark -2\pi x^{-2}$ $\checkmark 4x^{-5}$ (4)
7.3	$m_{\perp} = -2$ $y = 3(2-x)^2$ $= 3(4 - 4x + x^2)$ $= 12 - 12x + 3x^2$ $\frac{dy}{dx} = -12 + 6x$ $-2 = -12 + 6x$ $x = \frac{10}{6}$ $x = \frac{5}{3}$	$\checkmark m_{\perp} = -2$ $\checkmark$ S $\checkmark$ derivative = -2 $\checkmark$ answer (4)
[17]		

QUESTION 8/VRAAG 8		
8.1.1	$f(x) = (x + 1)(x - 2)(x + k)$ $\begin{array}{r} -1 \quad +6 \quad -8 \\ +1 \quad -5 \quad +2 \quad +8 \quad \quad -1 \\ \hline 1 \quad -6 \quad +8 \quad 0 \end{array}$ $f(x) = (x + 1)(x^2 - 6x + 8)$ $= (x + 1)(x - 2)(x - 4)$ $\therefore k = -4$ OR/OF $(x^2 - x - 2)(x + k)$ $= x^3 + kx^2 - x^2 - kx - 2x - 2k$ $= x^3 + (k - 1)x^2 - (k + 2)x - 2k$ Compare coefficients with $x^3 - 5x^2 + 2x + 8$ $k - 1 = -5 \quad \text{OR} \quad -(k + 2) = 2$ $k = -4 \quad \quad \quad -k - 2 = 2$ $\quad \quad \quad -k = 4$ $\quad \quad \quad k = -4$ OR/OF $\begin{array}{r} x^2 - 6x + 8 \\ x + 1 \overline{) x^3 - 5x^2 + 2x + 8} \\ \underline{x^3 + \quad x^2 \quad \quad \downarrow} \\ -6x^2 + 2x \quad \quad \downarrow \\ \underline{-6x^2 - 6x \quad \downarrow} \\ 8x + 8 \\ \underline{8x + 8} \\ 0 \end{array}$ $f(x) = (x + 1)(x^2 - 6x + 8)$ $= (x + 1)(x - 2)(x - 4)$ $\Rightarrow x + k = x - 4$ $\therefore k = -4$ OR/OF By inspection $(x + 1)(x - 2)(x + k)$ $\Rightarrow (-1)(2)(-k) = -8$ $2k = -8$ $k = -4$	✓M ✓ $k = -4$ OR/OF ✓M ✓ $k = -4$ OR/OF ✓M ✓ $k = -4$ OR/OF ✓M ✓ $k = -4$ OR/OF ✓✓AO

(2)

8.1.2	$f(x) = x^3 - 5x^2 + 2x + 8$ $f'(x) = 3x^2 - 10x + 2$ $0 = 3x^2 - 10x + 2$ $x = \frac{-(-10) \pm \sqrt{(-10)^2 - 4(3)(2)}}{2(3)}$ $x = 3,12 \text{ or/of } x = 0,21$ $y = (3,12)^3 - 5(3,12)^2 + 2(3,12) + 8 \approx -4,06$ $y = (0,21)^3 - 5(0,21)^2 + 7(0,21) + 8 = 8,21$ TPs: (3,12; -4,06) and/en (0,21; 8,21)	$\checkmark f'(x) = 0$ $\checkmark$ BOTH x -values $\checkmark$ BOTH y -values (3)
8.2		$\checkmark$ intercepts $\checkmark$ TPs $\checkmark$ shape (3)
8.3	Point of inflection $f'(x) = 3x^2 - 10x + 2$ $f''(x) = 6x - 10$ $0 = 6x - 10$ $x = \frac{10}{6}$ $x = \frac{5}{3}$ Concave down: $x < \frac{5}{3}$ OR/OF $x = \frac{0,21+3,12}{2}$ $x = 1,67$ Concave down: $x < 1,67$	$\checkmark$ M $\checkmark$ answer OR/OF $\checkmark$ M $\checkmark$ answer OR/OF $\checkmark \checkmark$ AO (2)

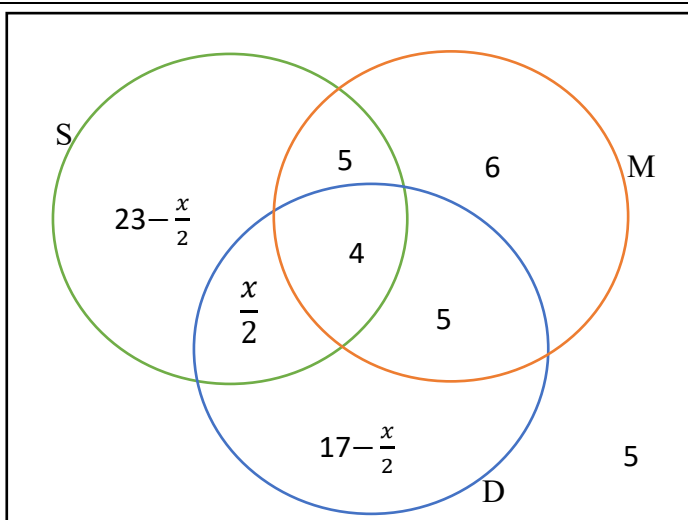
8.4	$0 < x < 0,21$ or $x > 3,12$ OR/OF $x \in (0; 0,21)$ or/of $(3,12; \infty)$	$\checkmark 0 < x < 0,21$ $\checkmark x > 3,12$ (2)
[12]		

QUESTION 9/ VRAAG 9		
9.1	Length parallel to wall = $-2x + 60$ $A = x(-2x + 60)$ $A = -2x^2 + 60x$	$\checkmark x(-2x + 60)$ (1)
9.2	$A = -2x^2 + 60x$ $A'(x) = -4x + 60$ $0 = -4x + 60$ $4x = 60$ $x = 15$ $A(15) = 60(15) - 2(15)^2$ $= 900 - 450$ $= 450 \text{ m}^2$ OR/OF $x = -\frac{b}{2a}$ $= -\frac{60}{2(-2)}$ $= 15$ $A(15) = 60(15) - 2(15)^2$ $= 900 - 450$ $= 450 \text{ m}^2$	$\checkmark -4x + 60 = 0$ $\checkmark x = 15$ $\checkmark 450 \text{ m}^2$ OR/OF $\checkmark SF$ $\checkmark x = 15$ $\checkmark 450 \text{ m}^2$ (3)

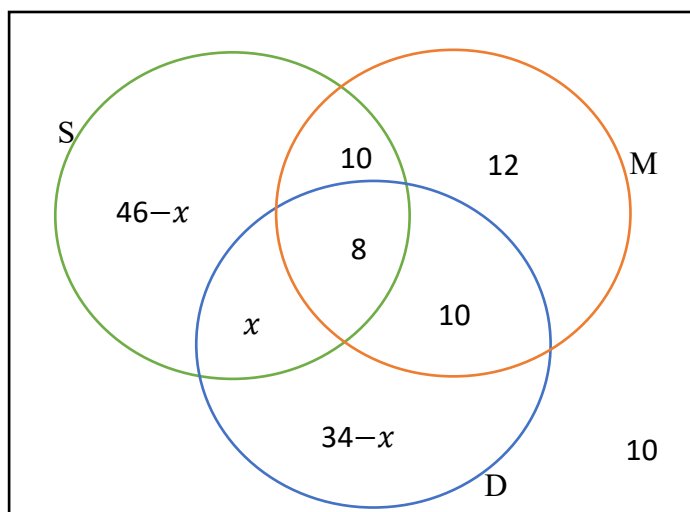
9.3	$5(2x) + 8y = 480$ $10x + 8y = 480$ $y = \frac{480-10x}{8}$ $A(x) = x \cdot y$ $A(x) = x \left(\frac{480-10x}{8} \right)$ $A(x) = 60x - \frac{5}{4}x^2$ $A'(x) = 60 - \frac{5}{2}x$ $0 = 60 - \frac{5}{2}x$ $x = 24$ OR/OF $5(2x) + 8y = 480$ $10x + 8y = 480$ $x = \frac{480-8y}{10}$ $A(x) = x \cdot y$ $A(x) = \left(\frac{480-8y}{10} \right) \cdot y$ $A(x) = 48y - \frac{4}{5}y^2$ $A'(x) = 48 - \frac{8}{5}y$ $0 = 48 - \frac{8}{5}y$ $y = 30$ $x = \frac{480-8(30)}{10}$ $x = 24$	✓ cost equation ✓ $y = \frac{480-10x}{8}$ ✓ SF ✓ $\frac{dA}{dx} = 0$ ✓ $x = 24$ OR/OF ✓ cost equation ✓ $x = \frac{480-8y}{10}$ ✓ SF ✓ $\frac{dA}{dx} = 0$ ✓ $x = 24$ (5)
[9]		

QUESTION 10/ VRAAG 10

10.1.1



OR/OF



✓ $23 - \frac{x}{2}$ and 5

✓ $\frac{x}{2}$ and 4

✓ $17 - \frac{x}{2}$ and 5

✓ 6 and 5

OR/OF

✓ $46 - x$ and 10

✓ x and 8

✓ $34 - x$ and 10

✓ 12 and 10

*Accept decimal input

(4)

10.1.2

$$50 = \frac{x}{2} + 23 - \frac{x}{2} + 5 + 4 + 17 - \frac{x}{2} + 5 + 6 + 5$$

$$\frac{x}{2} = 65 - 50$$

$$x = 30\%$$

OR/OF

$$100 = x + 46 - x + 10 + 8 + 34 - x + 10 + 12 + 10$$

$$x = 130 - 100$$

$$x = 30\%$$

✓ $x = 30\%$

OR/OF

✓ $x = 30\%$

*Accept decimal

(1)

10.1.3	Two events are independent if $P(S \cap M) = P(S) P(M)$ $P(S \cap M) = 18\% = 0,18$ $P(S)P(M) = 0,64 \times 0,40 = 0,256$ Since $0,18 \neq 0,256$, $\therefore$ Sports and Music are NOT independent.	✓M ✓answer (2)
10.2 English	Total possible arrangements Letter counts: • $S = 3$ • $T = 3$ • $I = 2$ • $A = 1$ • $C = 1$ Total letters = 10 $N(S) = \frac{10!}{3!3!2!}$ Arrangements that end with S Remaining letters: • $S = 2$ • $T = 3$ • $I = 2$ • $A = 1$ • $C = 1$ Total remaining letters = 9 $N(E) = \frac{9!}{2!3!2!}$ $P(E) = \frac{N(E)}{N(S)} = \frac{\frac{9!}{2!3!2!}}{\frac{10!}{3!3!2!}} = \frac{3}{10}$ or 0,3 or 30%	✓ $N(S) = \frac{10!}{3!3!2!}$ ✓ $N(E) = \frac{9!}{2!3!2!}$ ✓SF ✓answer (4)

10.2 Afrikaans	Totale moontlike rangskikkings Lettertellings: • $S = 2$ • $T = 3$ • $I = 2$ • $A = 1$ • $K = 1$ • $E = 1$ Totaal letters = 10 $N(S) = \frac{10!}{2!3!2!}$ Rangskikkings wat op S eindig Oorblywende letters: • $S = 1$ • $T = 3$ • $I = 2$ • $A = 1$ • $K = 1$ • $E = 1$ Totaal oorblywende letters:= 9 $N(E) = \frac{9!}{3!2!}$ $P(E) = \frac{N(E)}{N(S)} = \frac{\frac{9!}{3!2!}}{\frac{10!}{2!3!2!}} = \frac{1}{5}$ or 0,2 or 20%	✓ $N(S) = \frac{10!}{2!3!2!}$ ✓ $N(E) = \frac{9!}{3!2!}$ ✓ SF ✓ antwoord (4)
10.3	$\frac{5!}{3!(5-3)!} \left(\frac{7!}{3!(7-3)!} \right) + \frac{5!}{4!(5-4)!} \left(\frac{7!}{2!(7-2)!} \right) + \frac{5!}{5!(5-5)!} \left(\frac{7!}{1!(7-1)!} \right)$ $= (10)(35) + (5)(21) + (1)(7)$ $= 350 + 105 + 7$ $= 462$	✓ M ✓ answer (2)
[13]		

TOTAL/TOTAAL: 150



education

Department:
Education
North West Provincial Government
REPUBLIC OF SOUTH AFRICA

NASIONALE SENIOR SERTIFIKAAT

GRAAD 12

WISKUNDE V1

SEPTEMBER 2026

NASIENRIGLYNE

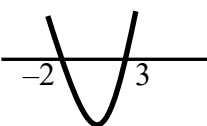
PUNTE: 150

Hierdie nasienriglyne bestaan uit 18 bladsye.

LET WEL:

- Indien 'n kandidaat 'n vraag TWEE keer beantwoord, merk slegs die EERSTE poging.
- Volgehoue akkuraatheid is DEURGAANS op ALLE aspekte van die nasienriglyne van toepassing.

VRAAG 1

1.1.1	$(3 - x)(2x + 8) = 0$ $x = 3$ of $2x = -8$ $x = -4$	$\checkmark x = 3$ $\checkmark x = -4$ (2)
1.1.2	$3x^2 - 7x - 2 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-(-7) \pm \sqrt{(-7)^2 - 4(3)(-2)}}{2(3)}$ $= \frac{7 \pm \sqrt{73}}{6}$ $x = 2,59$ of $x = -0,26$	$\checkmark$ substitusie in die korrekte formule $\checkmark x = 2,59$ $\checkmark x = -0,26$ (3)
1.1.3	$x^2 - x - 6 \geq 0$ $(x + 2)(x - 3) \geq 0$ KW: $x = -2$ of $x = 3$ $\therefore x \leq -2$ of $x \geq 3$ 	$\checkmark$ faktore $\checkmark$ kritieke waardes $\checkmark\checkmark$ antwoord (4)
1.1.4	$12^{2x} = 8(36^x)$ $(2^2 \cdot 3)^{2x} = 2^3 \cdot (2^2 \cdot 3^2)^x$ $2^{4x} \cdot 3^{2x} = 2^3 \cdot 2^{2x} \cdot 3^{2x}$ $\frac{2^{4x}}{2^3 \cdot 2^{2x}} = \frac{3^{2x}}{3^{2x}}$ $2^{2x-3} = 1$ $2^{2x-3} = 2^0$ $2x - 3 = 0$ $2x = 3$ $x = \frac{3}{2}$ OR	$\checkmark$ priem faktore $\checkmark$ eksponent wette $\checkmark$ 2 aan een kant, 3 aan ander kant $\checkmark$ eksponente gelyk stel $\checkmark$ antwoord (5)

	$12^{2x} = 8(36^x)$ $(2^2 \cdot 3)^{2x} = 2^3 \cdot (2^2 \cdot 3^2)^x$ $2^{4x} \cdot 3^{2x} = 2^3 \cdot 2^{2x} \cdot 3^{2x}$ $2^{4x} \cdot 3^{2x} = 2^{3+2x} \cdot 3^{2x}$ $2^{4x} = 2^{3+2x} \quad \text{or} \quad 3^{2x} = 3^{2x}$ $4x = 3 + 2x \quad x \in \mathbb{R}$ $2x = 3$ $x = \frac{3}{2}$	✓ priem faktore ✓ eksponent wette ✓ 2 vergelykings ✓ eksponente gelyk stel ✓ antwoord (5)
1.1.5	$6\sqrt{x-5} + x = 5$ $6\sqrt{x-5} = 5 - x$ $(6\sqrt{x-5})^2 = (5-x)^2$ $36(x-5) = 25 - 10x + x^2$ $36x - 180 = 25 - 10x + x^2$ $0 = x^2 - 46x + 205$ $0 = (x-41)(x-5)$ $x = 41 \text{ of } x = 5$ <i>n.v.t</i>	✓ isoleer wortel ✓ kwadreer beide kante ✓ standaardvorm ✓ beide antwoorde ✓ seleksie (5)
1.2	$x + y = -2$ $y = -x - 2$ $x^2 - 4x + y^2 + 8y + 2 = 0$ $x^2 - 4x + (-x-2)^2 + 8(-x-2) + 2 = 0$ $x^2 - 4x + x^2 + 4x + 4 - 8x - 16 + 2 = 0$ $2x^2 - 8x - 10 = 0$ $x^2 - 4x - 5 = 0$ $(x+1)(x-5) = 0$ $x = -1 \quad \text{of} \quad x = 5$ $y = -(-1) - 2 \quad y = -(5) - 2$ $= -1 \quad = -7$ OF	✓ y onderwerp ✓ substitusie ✓ standaardvorm ✓ beide x-waardes ✓ beide y-waardes (5)

	$x + y = -2$ $x = -y - 2$ $(-y - 2)^2 - 4(-y - 2) + y^2 + 8y + 2 = 0$ $y^2 + 4y + 4 + 4y + 8 + y^2 + 8y + 2 = 0$ $2y^2 + 16y + 14 = 0$ $y^2 + 8y + 7 = 0$ $(y + 7)(y + 1) = 0$ $y = -7 \quad \text{of} \quad y = -1$ $x = -(-7) - 2 \quad x = -(-1) - 2$ $= 5 \qquad \qquad = -1$	✓ x onderwerp ✓ substitusie ✓ standaardvorm ✓ beide y-waardes ✓ beide x-waardes (5)
1.3	$x^2 + k(2x - 4) + 5$ $= x^2 + 2kx - 4k + 5$ $= (x^2 + 2kx + k^2) - k^2 - 4k + 5$ $= (x + k)^2 - k^2 - 4k + 5$ Vir volkome vierkant: $-k^2 - 4k + 5 = 0$ $k^2 + 4k - 5 = 0$ $(k + 5)(k - 1) = 0$ $k = -5 \quad \text{of} \quad k = 1$ OF $x^2 + k(2x - 4) + 5$ $= x^2 + 2kx - 4k + 5$ $\Delta = b^2 - 4ac$ $= (2k)^2 - 4(1)(-4k + 5)$ $= 4k^2 + 16k - 20$ Vir volkome vierkant: $\therefore$ Gelyke wortels $\therefore \Delta = 0$ $4k^2 + 16k - 20 = 0$ $k^2 + 4k - 5 = 0$ $(k + 5)(k - 1) = 0$ $k = -5 \quad \text{of} \quad k = 1$	✓ vereenvoudig ✓ voltooi vierkant ✓ $-k^2 - 4k + 5 = 0$ ✓ beide antwoorde (4) ✓ vereenvoudig ✓ substitusie ✓ $4k^2 + 16k - 20 = 0$ ✓ beide antwoorde (4)
		[28]

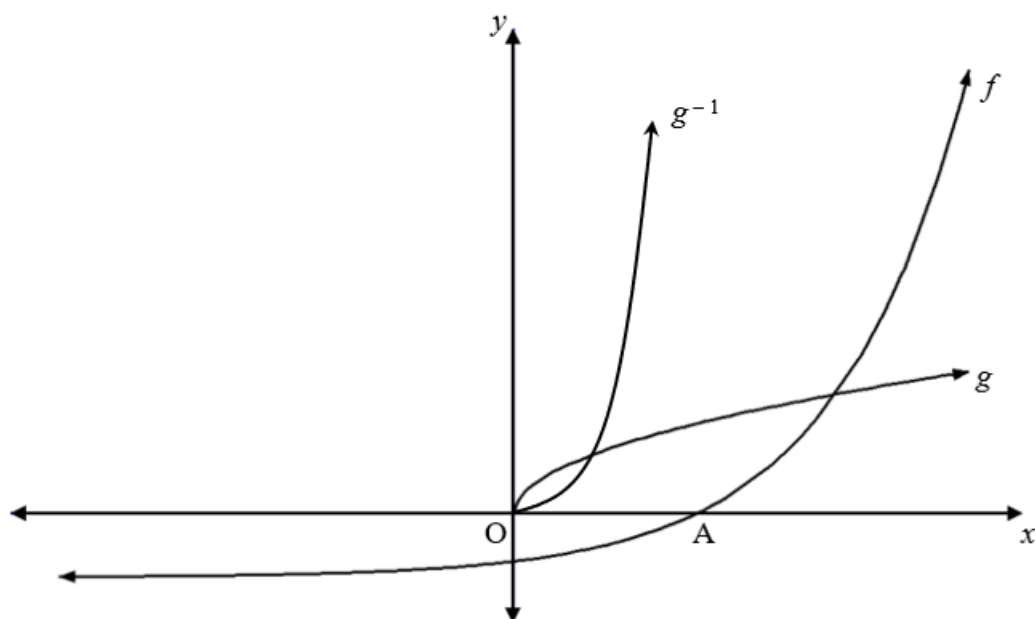
VRAAG 2

2.1.1	$\sum_{k=4}^p (2k - 5) = 3 + 5 + 7 + \dots$	✓ antwoord (1)
2.1.2	$T_n = a + (n - 1)d$ $= 3 + (n - 1)(2)$ $= 2n + 1$	✓ substitusie ✓ antwoord (2)
2.1.3	$T_{50} = 2(50) + 1$ $= 101$	✓ antwoord (1)
2.1.4	$\sum_{k=4}^p (2k - 5) < 5\,000$ $3 + 5 + 7 + \dots < 5\,000$ $S_n = \frac{n}{2}[2a + (n - 1)d]$ $\frac{n}{2}[2(3) + (n - 1)(2)] < 5\,000$ $6n + 2n^2 - 2n < 10\,000$ $2n^2 + 4n - 10\,000 < 0$ $n^2 + 2n - 5\,000 < 0$ $-71,71 < n < 69,72$ maar $n \in N$ $\therefore 0 < n \leq 69$ of $1 \leq n \leq 69$ $0 < p - 4 + 1 \leq 69$ $1 \leq p - 4 + 1 \leq 69$ $\therefore 3 < p \leq 72$ $4 \leq p \leq 72$	✓ substitusie ✓ standaardvorm ✓ kritieke waardes ✓ antwoord vir n ✓ eindpunte ✓ notasie (6)
2.2.1	$-1 + k ; 2 + k ; 8 + k ; \dots$ $\frac{2 + k}{-1 + k} = \frac{8 + k}{2 + k}$ $(2 + k)^2 = (8 + k)(-1 + k)$ $4 + 4k + k^2 = -8 + 8k - k + k^2$ $12 = 3k$ $k = 4$	✓ verhouding ✓ vereenvoudig ✓ antwoord (3)
2.2.2	3; 6; 12	✓ antwoord (1)
2.2.3	$r = 2$ of $r > 1$	✓ antwoord (1)
2.2.4	$S_n = \frac{a(r^n - 1)}{r - 1}$ $S_{15} = \frac{3(2^{15} - 1)}{2 - 1}$ $= 98\,301$	✓ substitusie ✓ antwoord (2)
		[17]

VRAAG 3

$T_3 = T_7$ simmetrie-as : $n = \frac{3+7}{2} = 5$ kleinste term : $n = \frac{-b}{2a}$ $5 = \frac{-b}{2a}$ $-10a = b \dots\dots\dots(1)$ $T_2 - T_1 = 3a + b \dots\dots\dots(2)$ $-14 = 3a + (-10a)$ $-14 = -7a$ $a = 2$ $(2) : b = -10(2) = -20$ $T_n = 2n^2 - 20n + c$ $10 = 2(5)^2 - 20(5) + c$ $c = 60$ $T_n = 2n^2 - 20n + 60$	$\checkmark \quad 5 = \frac{-b}{2a}$ $\checkmark \quad -14 = 3a + (-10a)$ $\checkmark \quad a = 2$ $\checkmark \quad b = -20$ $\checkmark$ substitusie $\checkmark \quad c = 60$
	(6)
	[6]

VRAAG 4



4.1	$y > -2$	✓ $y > -2$ (1)
4.2	$0 = 2^{x-1} - 2$ $2^1 = 2^{x-1}$ $x - 1 = 1$ $x = 2$ $\therefore A(2; 0)$	✓ $y = 0$ ✓ $x = 2$ (2)
4.3	$g: y = 2\sqrt{x}; x \geq 0 \ y \geq 0$ $g^{-1}: x = 2\sqrt{y}; y \geq 0 \ x \geq 0$ $\sqrt{y} = \frac{x}{2}$ $y = \frac{x^2}{4}; y \geq 0 \ x \geq 0$	✓ ruil x en y om ✓ $y = \frac{x^2}{4}$ (2)

4.4	$D(x) = 2\sqrt{x} - \frac{x^2}{4}$ $= 2x^{\frac{1}{2}} - \frac{x^2}{4}$ $D'(x) = x^{-\frac{1}{2}} - \frac{2x}{4}$ $0 = \frac{1}{\sqrt{x}} - \frac{x}{2}$ $\frac{x}{2} = \frac{1}{\sqrt{x}}$ $\left(\frac{x}{2}\right)^2 = \left(\frac{1}{\sqrt{x}}\right)^2$ $\frac{x^2}{4} = \frac{1}{x}$ $x^3 = 4$ $x = \sqrt[3]{4}$	✓ afstand ✓ $D'(x) = x^{-\frac{1}{2}} - \frac{2x}{4}$ ✓ kwadreer beide kante ✓ antwoord vir x (4)
4.5	$D(x) = 2\left(\sqrt[3]{4}\right)^{\frac{1}{2}} - \frac{\left(\sqrt[3]{4}\right)^2}{4} = 1,89$ $\therefore k > 1,89$	✓ maksimum afstand ✓ antwoord (2)
4.6	$f(x) = 2^{x-1} - 2$ Refleksie om y-as $2^{-x-1} - 2$ $2^{-(x+1)} - 2$ $\left(\frac{1}{2}\right)^{x+1} - 2$ Transleer dan 1 eenheid na regs en transleer 2 eenhede op	✓ refleksie om y-as ✓ 1 eenheid regs ✓ 2 eenhede op (3)
		[14]

VRAAG 5

5.1	$(3; -2)$	✓ $(3; -2)$ (1)
5.2	$0 = \frac{1}{2}(x - 3)^2 - 2$ $2 = \frac{1}{2}(x - 3)^2$ $4 = (x - 3)^2$ $\pm 2 = x - 3$ $x = 5 \quad \text{of} \quad x = 1$ $n.v.t \quad \therefore A(1; 0)$ OF $0 = \frac{1}{2}(x - 3)^2 - 2$ $0 = \frac{1}{2}(x^2 - 6x + 9) - 2$ $0 = \frac{1}{2}x^2 - 3x + \frac{5}{2}$ $0 = x^2 - 6x + 5$ $0 = (x - 5)(x - 1)$ $x = 5 \quad \text{of} \quad x = 1$ $n.v.t \quad \therefore A(1; 0)$	✓ $y = 0$ ✓ vereenvoudig ✓ $x = 1$ (3) ✓ $y = 0$ ✓ vereenvoudig ✓ $x = 1$ (3)
5.3	$y \in \mathbb{R}; y \neq -2$ OF $y \in (-\infty; -2) \cup (-2; \infty)$	✓ $y \neq -2$ (1) ✓ $(-\infty; -2) \cup (-2; \infty)$ (1)
5.4	$g(x) = \frac{a}{x + p} + q$ $= \frac{a}{x - 1} - 2$ $2 = \frac{a}{0 - 1} - 2$ $4 = -a$ $a = -4$ $g(x) = \frac{-4}{x - 1} - 2$	✓ substitusie van p en q ✓ substitusie van $B(0; 2)$ ✓ antwoord vir a (3)

5.5	$y = -x + c$ $-2 = -(1) + c$ $-1 = c$ $k(x) = -x - 1$ OF $y = -(x + p) + q$ $= -(x - 1) - 2$ $= -x + 1 - 2$ $k(x) = -x - 1$	✓ $m = -1$ ✓ substitusie (1 ; -2) ✓ antwoord (3) ✓ $m = -1$ ✓ substitusie (1 ; -2) ✓ antwoord (3)
5.6	$x \in (-\infty ; -1] \cup (1 ; 3]$ OF $x \leq -1$ of $1 < x \leq 3$	✓ $(-\infty ; -1]$ ✓✓ $(1 ; 3]$ (3) ✓ $x \leq -1$ ✓✓ $1 < x \leq 3$ (3)
5.7	$f(x) = \frac{1}{2}(x - 3)^2 - 2$ $= \frac{1}{2}(x^2 - 6x + 9) - 2$ $= \frac{1}{2}x^2 - 3x + \frac{5}{2}$ $f'(x) = x - 3$ $-1 = x - 3$ $x = 2$ $f(2) = -1,5$ $k(2) = -(2) - 1$ $= -3$ Vertikale afstand tussen f en k : $f(2) - k(2) = -1,5 - (-3)$ $= 1,5$ $\therefore 1,5 < t < 2$ OF	✓ vereenvoudig ✓ $f'(x) = -1$ ✓ $x = 2$ ✓ $f(2) = -1,5$ ✓ $k(2) = -3$ ✓ afstand ✓ antwoord (7)

$f(x) = \frac{1}{2}(x-3)^2 - 2$ $= \frac{1}{2}(x^2 - 6x + 9) - 2$ $= \frac{1}{2}x^2 - 3x + \frac{5}{2}$ $\frac{1}{2}x^2 - 3x + \frac{5}{2} = -x - 1 + t$ $\frac{1}{2}x^2 - 2x + \left(\frac{7}{2} - t\right) = 0$ $\Delta = b^2 - 4ac$ $0 = (-2)^2 - 4\left(\frac{1}{2}\right)\left(\frac{7}{2} - t\right)$ $0 = 4 - 7 + 2t$ $2t = 3$ $t = \frac{3}{2} = 1,5$ $\therefore 1,5 < t < 2$	✓ vereenvoudig ✓ gelykstelling ✓ standaard vorm ✓ $\Delta = 0$ ✓ $t = 1,5$ ✓ $t < 2$ ✓ antwoord
	(7) [21]

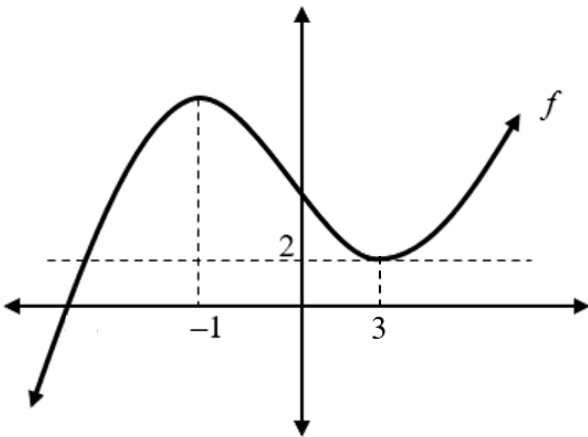
VRAAG 6

6.1	$A = P(1 + i)^n$ $= 1\,200\,000 \left(1 + \frac{0,098}{12}\right)^3$ $= R1\,229\,640,75$	✓ i en n ✓ substitusie ✓ antwoord (3)
6.2	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $1\,229\,640,75 = \frac{15\,000 \left[1 - \left(1 + \frac{0,098}{12}\right)^{-n}\right]}{\frac{0,098}{12}}$ $0,6694710772 = 1 - \left(1 + \frac{0,098}{12}\right)^{-n}$ $\left(1 + \frac{0,098}{12}\right)^{-n} = 0,3305289228$ $-n = \log_{\left(1 + \frac{0,098}{12}\right)} 0,3305289228$ $-n = -136,1112836$ $\therefore 137 \text{ maandelikse paaieimente}$	✓ substitusie ✓ vereenvoudiging ✓ gebruik van logs ✓ antwoord (4)
6.3	$A = P(1 + i)^n \quad \text{of}$ $A = 1\,229\,640,754 \left(1 + \frac{0,098}{12}\right)^{77} \quad A = 1\,200\,000 \left(1 + \frac{0,098}{12}\right)^{80}$ $= R2\,300\,212,589$ $F = \frac{x[(1 + i)^n - 1]}{i}$ $= \frac{15\,000 \left[\left(1 + \frac{0,098}{12}\right)^{77} - 1\right]}{\frac{0,098}{12}}$ $= R1\,599\,130,824$ $\text{Uitstaande balans} = R2\,300\,212,589 - R1\,599\,130,824$ $= R701\,081,76$ $\text{Reeds betaal} = 77(R15\,000)$ $= R1\,155\,000$ $\text{Totale koste na 77 maande} = R1\,155\,000 + R701\,081,76$ $= R1\,856\,081,767$ $\therefore \text{Wins} = R2\,000\,000 - R1\,856\,081,767$ $= R143\,918,24$ OF	✓ substitusie in A formule ✓ substitusie in F formule ✓ uitstaande balans ✓ paaieimente betaal ✓ totale koste ✓ wins (6)

Uitstaande tydperk = $136,1112836 - 77$ $= 59,1112836$ $P = \frac{x \left[1 - (1 + i)^{-n} \right]}{i}$ $= \frac{15\,000 \left[1 - \left(1 + \frac{0,098}{12} \right)^{-59,1112836} \right]}{\frac{0,098}{12}}$ $= R701\,081,76$ Reeds betaal = $77(R15\,000)$ $= R1\,155\,000$ Totale koste na 77 maande = $R1\,155\,000 + R701\,081,76$ $= R1\,856\,081,767$ $\therefore$ Wins = $R2\,000\,000 - R1\,856\,081,767$ $= R143\,918,24$	✓ n ✓ substitusie in P formule ✓ uitstaande balans ✓ paalemente betaal ✓ totale koste ✓ wins (6)
	[13]

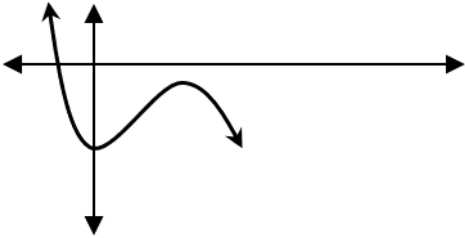
VRAAG 7

7.1	$f(x) = 3x^2 - x$ $f(x+h) = 3(x+h)^2 - (x+h)$ $= 3(x^2 + 2xh + h^2) - x - h$ $= 3x^2 + 6xh + 3h^2 - x - h$ $f(x+h) - f(x)$ $= 3x^2 + 6xh + 3h^2 - x - h - (3x^2 - x)$ $= 6xh + 3h^2 - h$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{6xh + 3h^2 - h}{h}$ $= \lim_{h \rightarrow 0} \frac{h(6x + 3h - 1)}{h}$ $= \lim_{h \rightarrow 0} (6x + 3h - 1)$ $= 6x - 1$ OF $f(x) = 3x^2 - x$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{[3(x+h)^2 - (x+h)] - (3x^2 - x)}{h}$ $= \lim_{h \rightarrow 0} \frac{3(x^2 + 2xh + h^2) - x - h - 3x^2 + x}{h}$ $= \lim_{h \rightarrow 0} \frac{3x^2 + 6xh + 3h^2 - x - h - 3x^2 + x}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{6xh + 3h^2 - h}{h}$ $= \lim_{h \rightarrow 0} \frac{h(6x + 3h - 1)}{h}$ $= \lim_{h \rightarrow 0} (6x + 3h - 1)$ $= 6x - 1$	✓ vereenvoudig $f(x+h)$ ✓ $6xh + 3h^2 - h$ ✓ substitusie ✓ gemeenskaplike faktor ✓ antwoord (5) ✓ substitusie ✓ vereenvoudig $f(x+h)$ ✓ $6xh + 3h^2 - h$ ✓ gemeenskaplike faktor ✓ antwoord (5)
7.2.1	$D_x[(x-3)(x-1)]$ $= D_x[x^2 - 4x + 3]$ $= 2x - 4$	✓ vereenvoudig ✓ $2x$ ✓ -4 (3)

7.2.2	$f(x) = 2\sqrt[3]{x^4} + \frac{3}{x^5}$ $= 2x^{\frac{4}{3}} + 3x^{-5}$ $f'(x) = \frac{8}{3}x^{\frac{1}{3}} - 15x^{-6}$	$\checkmark 2x^{\frac{4}{3}} \quad \checkmark 3x^{-5}$ $\checkmark \frac{8}{3}x^{\frac{1}{3}} \quad \checkmark -15x^{-6}$ (4)
7.3		$\checkmark$ slegs een x-afsnit by $x < -1$ $\checkmark$ maksimum draaipunt by $x = -1$ $\checkmark$ minimum draaipunt by $(3 ; 2)$ $\checkmark$ vorm (4)
		[16]

VRAAG 8

8.1	$f(x) = -2x^3 + 21x^2 - 60x + 43$ $f'(x) = -6x^2 + 42x - 60$ $0 = -6x^2 + 42x - 60$ $0 = x^2 - 7x + 10$ $0 = (x - 2)(x - 5)$ $x_A = 2 \text{ of } x_B = 5$	$\checkmark 0 = -6x^2 + 42x - 60$ $\checkmark$ faktore $\checkmark$ beide antwoorde (3)
8.2	$f''(x) = -12x + 42 \quad \text{OF} \quad x = \frac{5+2}{2}$ $0 = -12x + 42$ $12x = 42$ $x = \frac{7}{2} = 3,5$ $f(3,5) = -2(3,5)^3 + 21(3,5)^2 - 60(3,5) + 43$ $= 4,5$ $f'(3,5) = -6(3,5)^2 + 42(3,5) - 60$ $= 13,5$ $y - y_1 = m(x - x_1)$ $y - 4,5 = 13,5(x - 3,5)$ $y = 13,5x - 42,75$	$\checkmark$ metode $\checkmark$ x-waarde $\checkmark$ y-waarde $\checkmark f'(3,5) = 13,5$ $\checkmark$ antwoord (5)

8.3	$f(5) = -2(5)^3 + 21(5)^2 - 60(5) + 43$ $= 18$  $\therefore$ Geen positiewe wortels	✓ $f(5) = 18$ ✓ metode ✓ antwoord (3)
		[11]

VRAAG 9

9.1	$A = l^2 + 2\pi rh$ $= (2x)^2 + 2\pi xh$ $= 4x^2 + 2\pi xh$	✓ $(2x)^2 + 2\pi xh$ (1)
9.2	$20 = 4x^2 + 2\pi xh$ $20 - 4x^2 = 2\pi xh$ $h = \frac{20 - 4x^2}{2\pi x}$ $h(x) = \frac{20}{2\pi x} - \frac{4x^2}{2\pi x}$ $h(x) = \frac{10}{\pi x} - \frac{2x}{\pi}$	✓ $A = 20$ ✓ h die onderwerp ✓ antwoord (3)
9.3	$V(x) = \pi r^2 h$ $= \pi x^2 \left(\frac{10}{\pi x} - \frac{2x}{\pi} \right)$ $= 10x - 2x^3$	✓ substitusie (1)
9.4	$V'(x) = 10 - 6x^2$ $0 = 10 - 6x^2$ $6x^2 = 10$ $x^2 = \frac{10}{6}$ $x = 1,29$ $V(1,29) = 10(1,29) - 2(1,29)^3$ $= 8,61 \text{ m}^3$	✓ $V'(x)$ ✓ $V'(x) = 0$ ✓ antwoord vir x ✓ antwoord (4)
		[9]

VRAAG 10

10.1		✓ 8; 5 ✓ 3; 18; 10 ✓ 41; 52; 63 (3)
10.2	$P(\text{slegs EEN taal}) = \frac{41 + 63 + 52}{200}$ $= \frac{156}{200} = 0,78 = 78\%$	✓ substitusie ✓ antwoord (2)
10.3	$P(A) \times P(S) = \frac{70}{200} \times \frac{73}{200}$ $= \frac{511}{4\,000} \approx 0,13$ $P(A \text{ en } S) = \frac{11}{200} = 0,06$ $\therefore P(A) \times P(S) \neq P(A \text{ en } S)$ $\therefore \text{Nie onafhanklik nie}$	✓ $P(A) \times P(S)$ ✓ $P(A \text{ en } S)$ ✓ $P(A) \times P(S) \neq P(A \text{ en } S)$ ✓ gevolgtrekking (4)
		[9]

VRAAG 11

11.1	$8! = 40\,320$	✓ antwoord (1)
11.2	$\frac{(5!)(4!)}{8!}$ $= \frac{1}{14} = 0,07$	✓ $(5!)(4!)$ ✓ antwoord (A) (2)
11.3	Wiskunde en Fisiese Wetenskappe langs mekaar $= 3 \times 5! \times 2! \times 2 = 1\,440$ Totaal $= 3 \times 6! \times 2 = 4\,320$ Wiskunde en Fisiese Wetenskappe nie langs mekaar $= 4\,320 - 1\,440$ $= 2\,880$	✓ $3 \times 5! \times 2! \times 2$ ✓ $3 \times 6! \times 2$ ✓ antwoord (3)
		[6]
		TOTAAL: 150

KOGNITIEWE VLAKKE

WISKUNDE V1

	KOGNITIEWE VLAKKE				ONDERWERPE						
	VLAK 1 (20%)	VLAK 2 (35%)	VLAK 3 (30%)	VLAK 4 (15%)							
VRAAG	KENNIS	ROETINE PROSEDURES	KOMPLEKSE PROSEDURES	PROBLEEM OPLOSSING	ALGEBRA	PATRONE	FUNKSIES	FINANSIES	DIFFERENSIASIE	WAARSKYNLIK- HEID	TOTALE PUNT
1.1.1	2				2						
1.1.2	3				3						
1.1.3		4			4						
1.1.4			5		5						
1.1.5		5			5						
1.2		5			5						
1.3				4	4						28
2.1.1	1					1					
2.1.2	2					2					
2.1.3	1					1					
2.1.4			6			6					
2.2.1		3				3					
2.2.2	1					1					
2.2.3	1					1					
2.2.4	2					2					17
3				6		6					6
4.1	1						1				
4.2		2					2				
4.3		2					2				
4.4				4			4				
4.5				2			2				
4.6			3				3				14
5.1	1						1				
5.2		3					3				
5.3	1						1				
5.4		3					3				
5.5	3						3				
5.6	3						3				
5.7			7				7				21
6.1	3							3			
6.2			4					4			
6.3				6				6			13

Kopiereg voorbehou

	KOGNITIEWE VLAKKE				ONDERWERPE						
	VLAK 1 (20%)	VLAK 2 (35%)	VLAK 3 (30%)	VLAK 4 (15%)							
QUESTION	KENNIS	ROETINE PROSEDURES	KOMPLEKSE PROSEDURES	PROBLEEM OPLOSSING	ALGEBRA	PATRONE	FUNKSIES	FINANSIES	DIFFERENSIASIE	WAARSKYNLIK- HEID	TOTALE PUNT
7.1	5								5		
7.2.1		3							3		
7.2.2		4							4		
7.3			4						4		16
8.1		3							3		
8.2			5						5		
8.3			3						3		11
9.1		1							1		
9.2		3							3		
9.3			5						5		9
10.1		3								3	
10.2		2								2	
10.3		4								4	9
11.1	1										
11.2		2									
11.3			3								6
TOT	31	52	45	22	28	23	35	13	36	15	150
%	20%	35%	30%	15%							
Poi	20%	35%	30%	15%	25	25	35	15	35	15	150

MARKING GUIDELINES / NASIENRIGGLYNE

EXAMINATION EKSAMEN	NATIONAL SENIOR CERTIFICATE NASIONALE SENIOR SERTIFIKAAT
GRADE / GRAAD	12
DATE / DATUM	SEPTEMBER 2026
SUBJECT / VAK	MATHEMATICS / WISKUNDE
PAPER / VRAESTEL	1
MARK TOTAL / PUNTETOTAAL	150
DURATION (HOURS) / TYDSDUUR (UUR)	3
NUMBER OF PAGES / AANTAL BLADSYE	14





NOTE:

- If a candidate answered a question TWICE, only mark the first attempt.
- If a candidate cancelled the first attempt and did not answer the question again, mark the cancelled attempt.
- The principle of consistent accuracy (CA) will be applied throughout the memorandum.
- If a candidate has given the answer only, without showing any necessary working out, only ONE mark will be given.

NOTA:

- *Indien 'n kandidaat 'n vraag TWEE keer beantwoord het, merk slegs die eerste poging.*
- *Indien 'n kandidaat die eerste poging uitgekanselleer het en nie die vraag weer probeer het nie, merk die uitgekanselleerde poging.*
- *Die beginsel van konsekwente akkuraatheid (CA) sal reg deur die memorandum toegepas word.*
- *As die kandidaat slegs die antwoord gee, sonder om enige nodige berekeninge te toon, gee slegs EEN punt.*



QUESTION / VRAAG 1			
1.1	$x^2 - 1 = 7x$ $x^2 - 7x - 1 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-(-7) \pm \sqrt{(-7)^2 - 4(1)(-1)}}{2(1)}$ $x = 7,14 \text{ or } x = -0,14$	✓ Standard form/ <i>Standaard vorm</i> ✓ Substitution/ <i>Vervanging</i> ✓ Answer/ <i>Antwoord</i> Penalise Rounding/ <i>Penaliseer afronding</i>	(3)
1.2	$(x + 1)^2 \geq 0$ $x \in \mathbb{R}$ OR / OF $x \in (-\infty; \infty)$	✓✓ $x \in \mathbb{R}$ OR/OF ✓ Notation/ <i>Notasie</i> ✓ Critical Values/ <i>Kritieke waardes</i>	(2)
1.3	$\sqrt{x+3} - 2x = 0$ $\sqrt{x+3} = 2x$ $x + 3 = 4x^2$ $4x^2 - x - 3 = 0$ $(x - 1)(4x + 3) = 0$ $x = 1 \text{ or } x \neq -\frac{3}{4}$	✓ Isolate root/ <i>Isoleer wortel</i> ✓ Square both sides/ <i>Kwadreer beide kante</i> ✓ Standard form/ <i>Standaard vorm</i> ✓ Factors/ <i>Faktore</i> ✓ Answer/ <i>Antwoord</i> Penalise if $x = -\frac{3}{4}$ not eliminated <i>Penaliseer as $x = -\frac{3}{4}$ nie geëlimineer is nie</i>	(5)
1.4	$5 \cdot 3^{1-x} = 135$ $3^{1-x} = 27$ $3^{1-x} = 3^3$ $1 - x = 3$ $x = -2$	✓ Divide with 5/ <i>deel met 5</i> ✓ Prime bases/ <i>priemgetal basis</i> ✓ Answer/ <i>Antwoord</i>	(3)
[13]			



QUESTION / VRAAG 2			
2.1	$x^2 - 2kx + k^2 - 3 = 0$ $\Delta = (-2k)^2 - 4(1)(k^2 - 3)$ $\Delta = 4k^2 - 4k^2 + 12$ $\Delta = 12$ $\therefore$ Roots are Irrational and unequal / <i>Wortels is irrasioneel en ongelyk</i>	✓ Substitution / <i>Vervanging</i> ✓ Answer / <i>Antwoord</i> ✓ Conclusion / <i>Gevolgtrekking</i>	(3)
2.2	$16^{p^2} = \frac{2^{x^2}}{16^{x-1}}$ $2^{4p^2} = \frac{2^{x^2}}{2^{4(x-1)}}$ $2^{4p^2} = 2^{x^2-4x+4}$ $4p^2 = x^2 - 4x + 4$ $4p^2 = (x-2)^2$ $x-2 = \pm\sqrt{4p^2}$ $x = 2 \pm 2p$	✓ Prime bases / <i>Priem basis</i> ✓ Exponential laws / <i>Eksponent wet</i> ✓ Equate exponents / <i>Stel eksponente gelyk</i> ✓ Square root / <i>Vierkantswortel</i> ✓ Answer / <i>Antwoord</i>	(5)
2.3	$y = -\frac{1}{2}x + 3$ $-\frac{1}{2}x + 3 = x^2 - 6x$ $-x + 6 = 2x^2 - 12x$ $2x^2 - 11x - 6 = 0$ $(x-6)(2x+1) = 0$ $x = 6 \text{ or } -\frac{1}{2}$ $y = 0 \text{ or } y = \frac{13}{4}$ OR/OF $x = -2y + 6$ $y = (-2y + 6)^2 - 6(-2y + 6)$ $y = 4y^2 - 24y + 36 + 12y - 36$ $0 = 4y^2 - 13y$ $0 = y(4y - 13)$ $y = 0 \text{ or } y = \frac{13}{4}$ $x = 6 \text{ or } x = -\frac{1}{2}$	✓ Making y the subject ✓ Substitution / <i>vervanging</i> ✓ Standard form / <i>standaard vorm</i> ✓ Both x values / <i>Beide x waardes</i> ✓ Both y values / <i>beide y waardes</i> ✓ Making x the subject ✓ Substitution / <i>vervanging</i> ✓ standard form / <i>standaard vorm</i> ✓ Both y values / <i>Beide y waardes</i> ✓ Both x values / <i>beide x waardes</i>	(5)
[13]			



QUESTION / VRAAG 3			
3.1	$\frac{2^{0-1}}{0+1} + \frac{2^{1-1}}{1+1} + \frac{2^{2-1}}{2+1} + \frac{2^{3-1}}{3+1}$ $= \frac{1}{2} + \frac{1}{2} + \frac{2}{3} + 1$ $= 2\frac{2}{3} \text{ or } \frac{8}{3}$	✓ Expanding / <i>Uitbreiding</i> ✓ Answer / <i>Antwoord</i>	(2)
3.2.1	$\frac{x}{-2} = -\frac{32}{x}$ $x^2 = 64$ $x = \pm 8$	✓ Equating ratio / <i>Stel verhoudings =</i> ✓ Both answer / <i>Beide antwoorde</i>	(2)
3.2.2	$r = \frac{8}{-2} = -4$ $S_{11} = -\frac{2((-4)^{11}-1)}{-4-1}$ $= -1677722$	✓ $r = -4$ ✓ Substitution / <i>Vervanging</i> ✓ Answer / <i>Antwoord</i>	(3)
3.2.3	$\begin{array}{ccccc} -2 & & -17 & & -32 \\ & \searrow & & \searrow & \\ & -15 & & -15 & \\ & \swarrow & & \swarrow & \\ d & = -15 & & & \end{array}$ $T_{100} = -2 + (100 - 1)(-15)$ $= -1487$	✓ $d = -15$ ✓ Substitution / <i>vervanging</i> ✓ Answer / <i>Antwoord</i>	(3)
3.3	$\begin{array}{ccccc} 2 & & 16 & & 30 \\ & \searrow & & \searrow & \\ & 14 & & 14 & \\ 2a & = 14 & & & \\ a & = 7 & & & \\ \\ 3(7) + b & = 2 & & & \\ b & = -19 & & & \\ \\ T_n & = 7n^2 - 19n + 16 & & & \\ T_1 & = 7(1)^2 - 19(1) + 16 & & & \\ & = 4 & & & \\ \\ \text{OR} & & & & \\ T_0 & = 16 & & & \\ T_1 - T_0 & = -12 & & & \\ T_1 & = -12 + 16 & & & \\ & = 4 & & & \end{array}$	✓ $d = 14$ ✓ $a = 7$ ✓ $b = -19$ ✓ Substitution ✓ $T_1 = 4$	(5)



OR $T_1 = a + b + 16$ $T_2 = 4a + 2b + 16$ $T_3 = 9a + 3b + 16$ $T_2 - T_1 = 2$ $4a + 2b + 16 - (a + b + 16) = 2$ $3a + b = 2$ $T_3 - T_2 = 16$ $9a + 3b + 16 - (4a + 2b + 16) = 16$ $5a + b = 16$ $2a = 14$ $a = 7$ $3(7) + b = 2$ $b = -19$	
[15]	



QUESTION / VRAAG 4			
4.1	$d^2 = (4\sqrt{2})^2 + (4\sqrt{2})^2$ $d^2 = 64$ $d = 8$ $r = 4$ $\text{Area} = \pi(4)^2$ $= 16\pi$	✓ Substitution / Vervanging ✓ $d = 8$ ✓ Radius = 4 ✓ Substitution / Vervanging	(4)
4.2	Radius $\frac{1}{2}(4) = 2$ $\text{Area} = \pi(2)^2$ $= 4\pi$ OR $\text{Radius} = \frac{1}{2}(4\sqrt{2}) = 2\sqrt{2}$ $\text{Area} = \pi(2\sqrt{2})^2$ $= 8\pi$	✓ Radius = 2 ✓ Substitution ✓ Answer / Antwoord ✓ Radius $2\sqrt{2}$ ✓ Substitution ✓ Answer	(3)
4.3	$KJ = 4 - 2$ $= 2$ $\text{Area} = \pi(1)^2$ $= \pi$ OR $KJ = 4\sqrt{2} - 2$ $\text{Area} = \pi(2\sqrt{2} - 1)^2$ $= (9 - 4\sqrt{2})\pi$	✓ FH – 2 units ✓ KJ ✓ Answer / Antwoord	(3)
4.4	DO not mark this question.		(0)
[10]			



QUESTION / VRAAG 5			
5.1.1	$A = P(1 + i)^n$ $4277,28 = 3000 \left(1 + \frac{0,12}{4}\right)^{4n}$ $1,42576 = \left(1 + \frac{0,12}{4}\right)^{4n}$ $4n = \log_{\left(1 + \frac{0,12}{4}\right)}(1,42576)$ $4n = 11,99997896$ $n = 2,999994739$ $\therefore 3 \text{ years/jaar}$	✓ Correct Substitution / Korrekte vervanging ✓ Correct use of log / korrekte gebruik van log ✓ Answer / Antwoord	(3)
5.1.2	$A = 4277,28 \left(1 + \frac{0,13}{4}\right)^8 + \frac{1000 \left[\left(1 + \frac{0,13}{4}\right)^8 - 1\right]}{\frac{0,13}{4}}$ $A = 5524,43876 + 8971,616471$ $A = R14\,496,06$	✓ $4277,28 \left(1 + \frac{0,13}{4}\right)^8$ ✓ $\frac{1000 \left[\left(1 + \frac{0,13}{4}\right)^8 - 1\right]}{\frac{0,13}{4}}$ ✓ $i = \frac{0,13}{4}$ ✓ $n = 8$ ✓ Answer / Antwoord	(5)
5.2.1	$\frac{200000}{16} \times 100$ $= R1\,250\,000$	✓ $\frac{200000}{16} \times 100$ ✓ Answer / Antwoord	(2)
5.2.2	$1050000 \left(1 + \frac{0,11}{12}\right)^2 = \frac{x \left(1 - \left(1 + \frac{0,11}{12}\right)^{-238}\right)}{\frac{0,11}{12}}$ $x = R11\,063,26$	✓ $1050000 \left(1 + \frac{0,11}{12}\right)^2$ ✓ $i = \frac{0,11}{12}$ ✓ $n = 238$ ✓ Substitution / vervanging ✓ Answer / Antwoord	(5)
[15]			



QUESTION / VRAAG 6			
6.1		✓ Horizontal asymptote / <i>horisontale asimptoot</i> ✓ Vertical asymptote ✓ Shape of f ✓ Shape of g ✓ y –intercept of f / y –afsnit van f ✓ x –intercept of g / x –afsnit van g	(6)
6.2	$y \in \mathbb{R}; y \neq 1$	✓ Answer / <i>Antwoord</i>	(1)
6.3.1	$x \in \mathbb{R}; x > 0$	✓ Answer / <i>Antwoord</i>	(1)
6.3.2	$x \in \mathbb{R}; x \neq 2$ OR / OF $x \in (-\infty; 2) \cup (2; \infty)$	✓ Answer / <i>Antwoord</i>	(1)
6.4	$x \in (0; 1]$ OR / OF $0 < x \leq 1$	✓ Critical values / <i>kritieke waardes</i> ✓ Notation / <i>notasie</i>	(2)
6.5	$m = -1$ $y = -x + c$ $0 = -1 + c$ $c = 1$ $y = -x + 1$	✓ $m = -1$ ✓ Substitution / <i>vervanging</i> ✓ Answer / <i>Antwoord</i>	(3)
[14]			

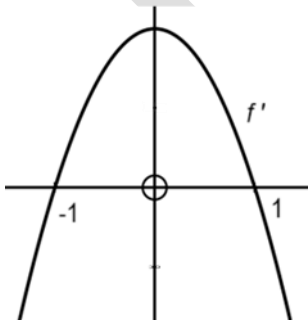


QUESTION / VRAAG 7			
7.1.1	$3 = \log_4 k$ $4^3 = k$ $k = 64$	✓ Substitution / vervanging ✓ Answer / antwoord	(2)
7.1.2	$y = \log_4 x$ $x = \log_4 y$ $g^{-1}(x) = 4^x$	✓ Swop x and y / ruil x en ✓ Answer / Antwoord ✓✓ Answer only / Slegs antwoord	(2)
7.2	ii	✓ Answer / antwoord	(1)
7.3.1	$y = a(x - x_1)(x - x_2)$ $y = a(x + 3)(x - 2)$ $8 = a(1 + 3)(1 - 2)$ $8 = a(4)(-1)$ $8 = -4a$ $a = -2$ $y = -2(x + 3)(x - 2)$ $y = -2(x^2 + x - 6)$ $y = -2x^2 - 2x + 12$ $\therefore b = -2$ and $c = 12$	✓ Substitution / vervanging ✓ Substitute (1; 8) / vervang ✓ Substitution / vervanging ✓ Simplification / vereenvoudiging	(4)
7.3.2	$f(x) = -2x^2 - 2x + 12$ $f'(x) = -4x - 2 < 0$ $x > -\frac{1}{2}$ OR / OF $x = \frac{-3+2}{2}$ or $x = \frac{-(-2)}{2(-2)}$ $x = -\frac{1}{2}$ $x > -\frac{1}{2}$	✓ $f'(x)$ ✓ $f'(x) < 0$ ✓ Answer / antwoord ✓ Substitution / vervanging ✓ $x = -\frac{1}{2}$ ✓ Answer / Antwoord ANSWER ONLY 2/3	(3)
7.3.3	$f'(1) = -4(1) - 2$ $= -6$ $y - 8 = -6(x - 1)$ $y = -6x + 14$ OR / OF $8 = -6(1) + c$ $c = 14$	✓ Substitution / Vervanging ✓ -6 ✓ Substitution / vervanging ✓ Answer / Antwoord ✓ Substitution / vervanging ✓ Answer / Antwoord	(4)



7.3.4	$p < -2$	✓ Critical Value / <i>kritieke waarde</i> ✓ notation / <i>notasie</i>	(2)
[18]			
QUESTION / VRAAG 8			
8.1	$f(x) = -2x^2$ $f(x+h) = -2(x+h)^2$ $= -2(x^2 + 2xh + h^2)$ $= -2x^2 - 4xh - 2h^2$ $f'(x) = \lim_{h \rightarrow 0} \frac{-2x^2 - 4xh - 2h^2 + 2x^2}{h}$ $= \lim_{h \rightarrow 0} \frac{-4xh - 2h^2}{h}$ $= \lim_{h \rightarrow 0} \frac{h(-4x - 2h)}{h}$ $= \lim_{h \rightarrow 0} (-4x - 2h)$ $= -4x - 2(0)$ $= -4x$	✓ $f(x+h)$ ✓ Substitution / <i>vervanging</i> ✓ Simplification / <i>vereenvoudiging</i> ✓ Factor / <i>faktor</i> ✓ Answer / <i>antwoord</i> <i>Penalise notation</i>	(5)
8.2.1	$f(x) = \frac{3x^4}{3x^2} - \frac{2x}{3x^2} + \frac{6x^2}{3x^2}$ $= x^2 - \frac{2}{3x} + 2$ $= x^2 - \frac{2}{3}x^{-1} + 2$ $\therefore f'(x) = 2x + \frac{2}{3}x^{-2}$	✓ Simplification / <i>vereenvoudiging</i> ✓ x^{-1} ✓ $2x$ ✓ $\frac{2}{3}x^{-2}$	(4)
8.2.2	$f'(1) = 2(1) + \frac{2}{3}(1)^{-2}$ $= \frac{8}{3}$ or/of $2\frac{2}{3}$	✓ Substitution / <i>Vervanging</i> ✓ Answer / <i>Antwoord</i>	(2)
8.3.1	$y = 5 + \sqrt[3]{t^6}$ $y = 5 + t^{\frac{6}{3}}$ $y = 5 + t^2$ $\frac{dy}{dt} = 2t$	✓ $y = 5 + t^2$ ✓ Answer / <i>antwoord</i>	(2)
8.3.2	$y = 5 + \left(\frac{1}{x}\right)^2$ $y = 5 + x^{-2}$ $\frac{dy}{dx} = -2x^{-3}$	✓ Substitution / <i>vervanging</i> ✓ $y = 5 + x^{-2}$ ✓ answer / <i>antwoord</i>	(3)



[16]			
QUESTION / VRAAG 9			
9.1.1	$B(0; 4)$	✓ Answer / Antwoord	(1)
9.1.2	$y = -(x + k)(x + 2)^2$ $4 = -(0 + k)(0 + 2)^2$ $4 = -4k$ $k = -1$	✓ Substitution / vervanging ✓ Simplification / vervanging	(2)
9.1.3	$A(-2; 0)$ $m = \frac{4-0}{0+2}$ $= 2$	✓ $A(-2; 0)$ ✓ Substitution / vervanging ✓ Answer / antwoord	(3)
9.1.4	$f(x) = -(x - 1)(x + 2)^2$ $f(x) = -(x - 1)(x^2 + 4x + 4)$ $f(x) = -(x^3 + 4x^2 + 4x - x^2 - 4x - 4)$ $f(x) = -(x^3 + 3x^2 - 4)$ $f(x) = -x^3 - 3x^2 + 4$ $f'(x) = -3x^2 - 6x$ $f''(x) = -6x - 6$ $-6x - 6 > 0$ $x < -1$	✓ $f(x) = -x^3 - 3x^2 + 4$ ✓ $f'(x) = -3x^2 - 6x$ ✓ $f''(x) = -6x - 6 > 0$ ✓ Answer / antwoord Answer only Full marks: 2 marks for $x = -1$ 2 marks for Notation	(4)
9.2		✓✓ x -intercepts/afsnitte ✓ Shape / vorm ✓ Turning point / draaipunt	(4)
[14]			



QUESTION / VRAAG 10			
10.1	$s = \frac{d}{t}$ $6 = \frac{d}{t}$ $d = 6t$	✓ Answer / antwoord	(1)
10.2	B: $20 - 9t$ $AB^2 = (6t)^2 + (20 - 9t)^2$ $AB^2 = 36t^2 + 400 - 360t + 81t^2$ $AB^2 = 117t^2 - 360t + 400$	✓ $20 - 9t$ ✓ Substitution / vervanging	(2)
10.3	Min AB: $AB^2'(t) = 234t - 360 = 0$ $t = \frac{20}{13} = 1,538 \text{ s}$	✓ $234t - 360$ ✓ $= 0$ ✓ Answer / antwoord	(3)
10.4	Min AB: $= \sqrt{117 \left(\frac{20}{13}\right)^2 - 360 \left(\frac{20}{13}\right) + 400}$ $= 11 \text{ m}$	✓ Answer / antwoord	(1)
			[7]



QUESTION / VRAAG 11			
11.1.1		✓ Branch 1 / tak 1 ✓ Branch 2 / tak 2 ✓ Branch 3 / tak 3 <i>Penalise once if outcomes are not shown</i>	(3)
11.1.2	0,92	✓ answer / antwoord	(1)
11.1.3	$(0,65 \times 0,7) + (0,35 \times 0,08)$ $= 0,483$ $0,483 \times 120$ $\approx 58 \text{ students / studente}$	✓ $(0,65 \times 0,7)$ ✓ $(0,35 \times 0,08)$ ✓ $\times 120$ ✓ 58	(4)
11.2	$\frac{15}{30} \times \frac{14}{29}$ $= \frac{7}{29}$ OR / OF 0,24	✓ $\frac{15}{30}$ ✓ $\frac{14}{29}$ ✓ Answer / antwoord	(3)
11.3.1	$6! = 720$	✓ Answer / antwoord	(1)
11.3.2	Top: 1 Middel: 2! Bottom: 2! $\therefore 1 \times 2! \times 2! = 4$	✓ 2! ✓ 2! ✓ Answer / antwoord	(3)
			[15]
GRAND TOTAL / GROOTTOTAAL: [150]			



**Western Cape
Government**

Education

FOR YOU

**NATIONAL SENIOR CERTIFICATE/
NASIONALE SENIOR SERTIFIKAAT**

GRADE 12 / GRAAD 12

**MATHEMATICS P1/ WISKUNDE V1
SEPTEMBER 2026
MARKING GUIDELINES / NASIENRIGLYNE**

MARKS / PUNTE: 150

These marking guidelines consist of 18 pages.

Hierdie nasienriglyne bestaan uit 18 bladsye.

NOTE:

- If a candidate answers a question **TWICE**, only mark the **FIRST** attempt.
- Consistent Accuracy applies in all aspects of the marking guidelines.

LET WEL:

- Indien 'n kandidaat 'n vraag **TWEE** keer beantwoord, sien slegs die **EERSTE** poging na.
- Volgehoue akkuraatheid is **DEURGAANS** op **ALLE** aspekte van die nasienriglyne van toepassing.

QUESTION 1/VRAAG 1

1.1.1	$x^2 + 3x - 10 = 0$ $(x + 5)(x - 2) = 0$ $x = -5 \text{ or } x = 2$	✓ factorise ✓✓ answers (3)
1.1.2	$2x^2 - 7x - 3 = 0$ $x = \frac{-(-7) \pm \sqrt{(-7)^2 - 4(2)(-3)}}{2(2)}$ $x = 3,89 \text{ or } x = -0,39$	✓ std form ✓ sub ✓✓ answers (4)
1.1.3	$3x^2 + 13x + 10 \geq 0$ $(3x + 10)(x + 1) \geq 0$ $cv: x = -\frac{10}{3} \text{ or } x = -1$ $x \leq -\frac{10}{3} \text{ or } x \geq -1$	✓ cv / factors ✓✓ answers (3)
1.1.4	$2\sqrt{x+9} = x - 6$ $(2\sqrt{x+9})^2 = (x-6)^2$ $4x + 36 = x^2 - 12x + 36$ $x^2 - 16x = 0$ $x(x - 16) = 0$ $x \neq 0 \text{ or } x = 16$	✓ isolate surd ✓ square both sides ✓ std form ✓ answer with selection (4)

1.2	$x + y = 8$	✓	equation
	$x = 8 - y$	✓	x subject
	$(8 - y)^2 + 5(8 - y)y + 6y^2 = 0$	✓	substitute
	$64 - 16y + y^2 + 40y - 5y^2 + 6y^2 = 0$		
	$2y^2 + 24y + 64 = 0$	✓	standard form
	$y^2 + 12y + 32 = 0$		
	$(y + 8)(y + 4) = 0$	✓	both y values
	$y = -8 \text{ or } y = -4$	✓	both x values
	$x = 16 \text{ or } x = 12$		
	OR		
	$x + y = 8$	✓	equation
	$y = 8 - x$	✓	y subject
	$x^2 + 5x(8 - x) + 6(8 - x)^2 = 0$	✓	substitute
	$x^2 + 40x - 5x^2 + 384 - 96x + 6x^2 = 0$		
	$2x^2 - 56x + 384 = 0$		
	$x^2 - 28x + 192 = 0$	✓	standard form
	$(x - 16)(x - 12) = 0$		
	$x = 16 \text{ or } x = 12$	✓	both x values
	$y = -8 \text{ or } y = -4$	✓	both y values
	OR		
	$x + y = 8$	✓	equation
	$x = 8 - y$	✓	x subject of formula
	$x^2 + 5xy + 6y^2 = 0$		
	$(x + 3y)(x + 2y) = 0$	✓	factorise
	$x = -3y \text{ or } x = -2y$	✓	solve
	$8 - y = -3y \text{ or } 8 - y = -2y$		
	$2y = -8 \text{ or } y = -8$		
	$y = -4 \text{ or } y = -8$	✓	both y values
	$x = 12 \text{ or } x = 16$	✓	both x values (6)

1.3	$\frac{1}{a} + \frac{1}{b} = \frac{b+a}{ab}$ $a = b^2 - 1$ $= (b+1)(b-1)$ $\text{from: } a^2 = b(b+1)$ $a(b+1)(b-1) = b(b+1)$ $\therefore a(b-1) = b$ $\therefore ab = b+a$ $\frac{1}{a} + \frac{1}{b} = \frac{b+a}{b+a} = 1$	✓ a ✓ sub ✓ simplify ✓ answer (4)
		[24]

QUESTION 2/VRAAG 2

2.1.1	$\begin{array}{ccc} 2k-7 & k+8 & 2k-1 \\ & -k+15 & k-9 \end{array}$ $-k+15 = k-9$ $-2k = -24$ $k = 12$	✓ first diff ✓ equate ✓ answer (3)
2.1.2	$20 \quad 26 \quad 32 \quad \dots$ $S_{30} = \frac{30}{2} [2(20) + (30-1)(6)]$ $= 3210$ OR $20 \quad 26 \quad 32 \quad \dots$ $T_{30} = 20 + (30-1)(6)$ $= 194$ $S_{30} = \frac{30}{2} [20 + 194]$ $= 3210$	✓ new sequence ✓ a and d ✓ sub ✓ answer ✓ new sequence ✓ a and l ✓ sub ✓ answer (4)

2.2.1	$\frac{a}{1 - \frac{1}{2}} = 6$ $\frac{a}{\frac{1}{2}} = 6$ $a = 3$ $T_7 = 3 \left(\frac{1}{2} \right)^6$ $= \frac{3}{64}$	✓ sub ✓ a ✓ sub ✓ answer (4)
2.2.2	$n = p - 2 + 1$ $n = p - 1$ $\frac{\frac{3}{2} \left(\left(\frac{1}{2} \right)^{p-1} - 1 \right)}{\left(\frac{1}{2} \right) - 1} = \frac{45}{16}$ $\left(\frac{1}{2} \right)^{p-1} - 1 = -\frac{15}{16}$ $\left(\frac{1}{2} \right)^{p-1} = \frac{1}{16}$ $\left(\frac{1}{2} \right)^{p-1} = \left(\frac{1}{2} \right)^4$ $p = 5$	✓ n ✓ $r = \frac{1}{2}$ ✓ sub ✓ simplify ✓ answer (5)

2.2.3	$\sum_{k=2}^{20} 3(2)^{1-k} = m$ $\frac{3}{2} + \frac{3}{4} + \frac{3}{8} + \dots + \frac{3}{2^{19}} = m$ $\sum_{k=2}^{20} 24(2)^{-k} = 6 + 3 + \frac{3}{2} + \dots + \frac{24}{2^{20}}$ $= 4 \left(\frac{3}{2} + \frac{3}{4} + \frac{3}{8} + \dots + \frac{3}{2^{19}} \right)$ $= 4m$ OR $\sum_{k=2}^{20} 3(2)^{1-k} = m$ $\sum_{k=2}^{20} 6(2)^{-k} = m$ $\sum_{k=2}^{20} 24(2)^{-k} = 4m$ OR $\sum_{k=2}^{20} 24(2)^{-k} = \sum_{k=2}^{20} 4 \times 3 \times 2(2)^{-k}$ $= 4 \sum_{k=2}^{20} 3 \times 2(2)^{-k}$ $= 4 \sum_{k=2}^{20} 3(2)^{1-k} = 4m$ OR	✓ expand ✓ expand ✓ answer ✓ $\sum_{k=2}^{20} 6(2)^{-k} = m$ ✓ $\sum_{k=2}^{20} 4 \times 6(2)^{-k}$ ✓ answer ✓ $\sum_{k=2}^{20} 4 \times 3 \times 2(2)^{-k}$ ✓ $4 \sum_{k=2}^{20} 3 \times 2(2)^{-k}$ ✓ answer ✓ sub and answer
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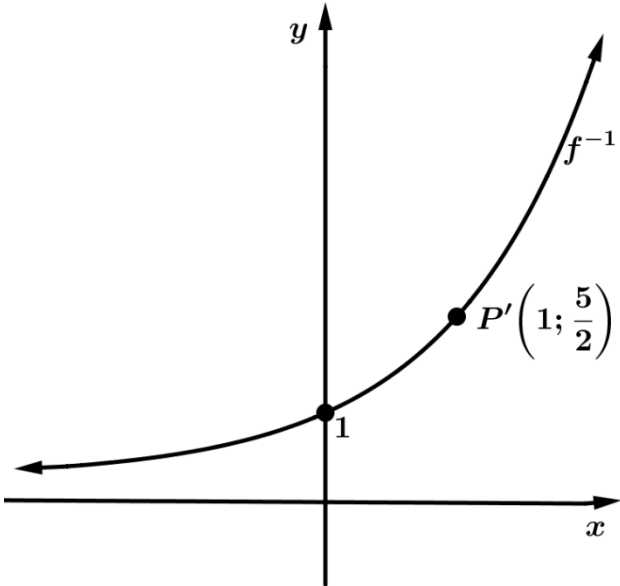
	$\frac{\frac{3}{2} \left(\left(\frac{1}{2} \right)^{20} - 1 \right)}{\left(\frac{1}{2} \right) - 1} = 3 = m$ $\frac{6 \left(\left(\frac{1}{2} \right)^{20} - 1 \right)}{\left(\frac{1}{2} \right) - 1} = 12$ $12 = 4 \times 3 = 4m$	✓ sub and answer ✓ answer (3)
		[19]

QUESTION 3/VRAAG 3

3.1	$\begin{array}{cccc} -14 & 0 & 10 & 16 \\ & 14 & 10 & 6 \\ & & -4 & -4 \end{array}$ $2a = -4 \quad 3(-2) + b = 14 \quad -2 + 20 + c = -14$ $a = -2 \quad b = 20 \quad c = -32$ $T_n = -2n^2 + 20n - 32$	$\checkmark$ a $\checkmark$ b $\checkmark$ c	(3)
3.2	$-2n^2 + 20n - 32 < -110$ $-2n^2 + 20n + 78 < 0$ $n^2 - 10n - 39 > 0$ $(n+3)(n-13) > 0$ $n < -3 \text{ or } n > 13$ $\therefore n > 13$	$\checkmark$ $T_n < -110$ $\checkmark$ std form $\checkmark$ factors $\checkmark$ selection	(4)
			[7]

QUESTION 4/VRAAG 4

4.1	$1 = \log_a \frac{5}{2}$ $a = \frac{5}{2}$	$\checkmark$ sub $\checkmark$ answer	(2)
4.2	$K(1;0)$	$\checkmark\checkmark$ answer	(2)
4.3	$x = \log_{\frac{5}{2}} y$ $y = \left(\frac{5}{2}\right)^x$ or $x = \left(\frac{5}{2}\right)^y$ $y = \left(\frac{5}{2}\right)^x$	$\checkmark$ swop x and y $\checkmark$ expo form $\checkmark$ expo form $\checkmark$ swop x and y	(2)

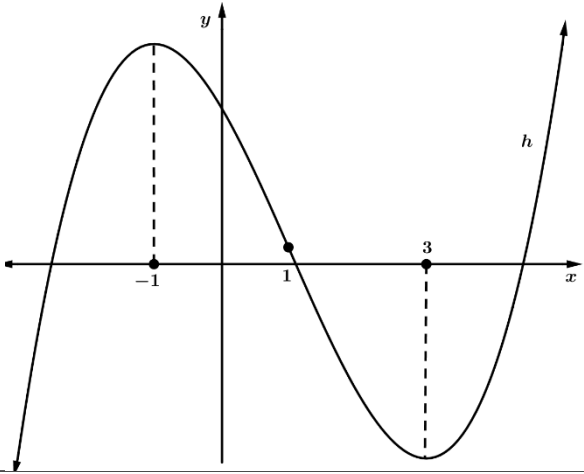
4.4		✓ intercept ✓ asymptote ✓ shape (3)
4.5	$-3 < x \leq -\frac{1}{2}$	✓ answer (2)
		[11]

QUESTION 5/VRAAG 5

5.1	$A(0; -7)$	✓ x ✓ y (2)
5.2	$x - 7 = -x + 1$ $2x = 8$ $x = 4$ $y = -3$ $C(4; -3)$ $f(x) = \frac{a}{x-4} - 3$ $-7 = \frac{a}{0-4} - 3$ $-4 = \frac{a}{-4}$ $a = 16$	✓ equate ✓ x ✓ y ✓ sub into equn ✓ a (5)
5.3	$x > 4$	✓ answer (1)
5.4	$x - 7 = \frac{16}{x-4} - 3$ $x - 4 = \frac{16}{x-4}$ $x^2 - 8x + 16 = 16$ $x(x - 8) = 0$ $x = 0$ or $x = 8$ $A(0; -7)$ $B(8; 1)$ $AB = \sqrt{(0-8)^2 + (-7-1)^2}$ $= 8\sqrt{2}$	✓ equate ✓ coord of B ✓ sub ✓ answer (4)
		[12]

QUESTION 6/VRAAG 6

6.1	$x^2 - 2x - 3 = 0$ $(x+1)(x-3) = 0$ $x = -1 \text{ or } x = 3$ $AB = 4$	✓ $y = 0$ ✓ answer (2)
6.2	$x = -\frac{-2}{2(1)}$ $x = 1$ $y = (1)^2 - 2(1) - 3$ $y = -4$ $C(1; -4)$	✓ sub ✓ x value ✓ y value (3)
6.3	$KM = -2x + 1 - (x^2 - 2x - 3)$ $= -x^2 + 4$ $x = -\frac{(0)}{2(-1)}$ $x = 0$ $KM_{\max} = -(0)^2 + 4$ $= 4$ OR $KM = -2x + 1 - (x^2 - 2x - 3)$ $= -x^2 + 4$ $f'(x) = -2x$ $-2x = 0$ $x = 0$ $KM_{\max} = -(0)^2 + 4$ $= 4$	✓ $f(x) - g(x)$ ✓ simplify ✓ x ✓ answer (4) ✓ $f(x) - g(x)$ ✓ simplify ✓ x ✓ answer (4)
6.4	$x < -1 \text{ or } x > 3$	✓ $x < -1$ ✓ $x > 3$ (2)

6.5		✓ shape ✓✓ tps ✓ concavity (4)
		[15]

QUESTION 7/VRAAG 7

7.1.1	$1 + i_{eff} = \left(1 + \frac{9,35}{400}\right)^4$ $\therefore i_{eff} = \left(1 + \frac{9,35}{400}\right)^4 - 1$ $\frac{r}{100} = 0,096829$ $\therefore r = 9,68\%$	✓ <i>i</i> ✓ sub ✓ answer (3)
7.1.2	$A = 50\,000 \left(1 + \frac{0,0935}{4}\right)^{24}$ $= R87\,057,32$ OR $A = 50\,000 \left(1 + \frac{9,68}{100}\right)^6$ $= R87\,043,16$	✓ sub ✓ answer ✓ sub ✓ answer (2)

QUESTION 8/VRAAG 8

8.1	$f(x) = x^2 + x$ $f(x+h) = (x+h)^2 + (x+h)$ $= x^2 + 2xh + h^2 + x + h$ $f(x+h) - f(x) = 2xh + h^2 + h$ $f'(x) = \lim_{h \rightarrow 0} \frac{2xh + h^2 + h}{h}$ $= \lim_{h \rightarrow 0} \frac{h(2x + h + 1)}{h}$ $= \lim_{h \rightarrow 0} (2x + h + 1)$ $= 2x + 1$ OR $f'(x) = \lim_{h \rightarrow 0} \frac{(x+h)^2 + (x+h) - (x^2 + x)}{h}$ $= \lim_{h \rightarrow 0} \frac{x^2 + 2xh + h^2 + x + h - x^2 - x}{h}$ $= \lim_{h \rightarrow 0} \frac{2xh + h^2 + h}{h}$ $= \lim_{h \rightarrow 0} \frac{h(2x + h + 1)}{h}$ $= \lim_{h \rightarrow 0} (2x + h + 1)$ $= 2x + 1$	↻ $f(x+h)$ ↻ simplify ↻ sub ↻ factorise ↻ answer ↻ $f(x+h)$ ↻ $f(x+h) - f(x)$ ↻ simplify ↻ factorise ↻ answer (5)
8.2.1	$D_x \left[-x^5 + 2x^{-3} - 5m^3 \right]$ $= -5x^4 - 6x^{-4}$	✓ $-5x^4$ ✓ $-6x^{-4}$ ✓ 0 (3)

QUESTION 10/VRAAG 10

10.1	$A(35) = \frac{600 + 40(35) - (35)^2}{1200}$ $= 0,65$	✍ sub ✍ answer (2)
10.2	$A(x) = \frac{600 + 40x - x^2}{1200}$ $= \frac{1}{2} + \frac{1}{30}x - \frac{1}{1200}x^2$ $A'(x) = \frac{1}{30} - \frac{1}{600}x$ $\frac{1}{30} - \frac{1}{600}x = 0$ $\frac{1}{600}x = \frac{1}{30}$ $x = 20$	✓ simplify ✓ $A'(x)$ ✓ $= 0$ ✓ answer (4)
10.3	$P(A \text{ and } C) = P(A) \times P(C)$ $= \left(\frac{600 + 40(20) - (20)^2}{1200} \right) \left(0,9 - \frac{20}{100} \right)$ $= \left(\frac{5}{6} \right) \left(\frac{7}{10} \right)$ $= \frac{35}{60}$	✓ sub ✓ answer (2)
		[8]

QUESTION 11/VRAAG 11

11.1.1	$d = 5$ $e = 4$ $f = 7$ $g = 5$	✓ d ✓ e ✓ f ✓ g	(4)
11.1.2	$\frac{43}{54}$ or 0,7963 or 79,63%	✓ 43 ✓ 54	(2)
11.2.1	$10! = 3\,628\,800$	✓ answer	(1)
11.2.2	$3! \times 7! = 30240$	✓ $3!$ ✓ $7!$	(2)
11.2.3	$10 \times 9 \times 8 = 720$	✓✓ answer	(2)
11.2.4	Probability consecutive = $\frac{2! \times 9!}{10!}$ $= \frac{1}{5}$ $P(GH') = 1 - \frac{1}{5}$ $= \frac{4}{5}$ OR GH consecutive = $9! \times 2!$ not consecutive = $10! - 9! \times 2!$ Probability = $\frac{10! - 9! \times 2!}{10!}$ $= \frac{4}{5}$	✓ $9! \times 2!$ ✓ $10!$ in denom ✓ $1 - \frac{1}{5}$ ✓ answer ✓ $9! \times 2!$ ✓ $10! - 9! \times 2!$ ✓ $10!$ in denom ✓ answer	(4) (4)
			[15]