



education

**MPUMALANGA PROVINCE
REPUBLIC OF SOUTH AFRICA**

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

Stanmorephysics.com

MATHEMATICS P1

SEPTEMBER 2025

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MARKS: 150

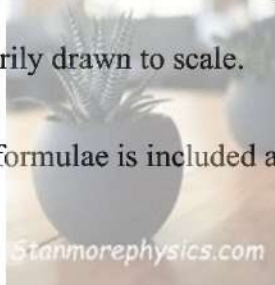
TIME: 3 HOURS

This question paper consists of 10 pages, 1 formula sheet and a 22-page SPECIAL ANSWER BOOK.

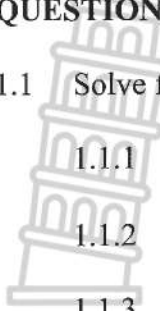
INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. The question paper consists of 10 questions.
2. Answer ALL the questions on the SPECIAL ANSWER BOOK provided.
3. Clearly show ALL calculations, diagrams, graphs, etc. which you have used in determining the answers.
4. Answers only will NOT necessarily be awarded full marks.
5. You may use an approved scientific calculator (non-programmable and non-graphical) unless stated otherwise.
6. If necessary, round off answers to TWO decimal places, unless stated otherwise.
7. Diagrams are NOT necessarily drawn to scale.
8. An information sheet with formulae is included at the end of the question paper.
9. Write neatly and legibly.



QUESTION 11.1 Solve for x if:


 1.1.1 $6x^2 - 2x = 0$ (2)

1.1.2 $2x^2 = 1 - 4x$ (3)

1.1.3 $\sqrt{x-2} + 4 = x$ (4)

1.1.4 $3^{4x} - 8 \cdot 3^{2x} - 9 = 0$ (3)

1.1.5 $-x^2 - x + 12 < 0$ (4)

1.2 Solve for x and y simultaneously:

$x - y = 3$ and $x^2 - xy - 2y^2 = 10$ (6)

1.3 Given: $(a+b)(a-b) = 2b(8a-b)$, $a > 0$, $b > 0$ Determine: $(a+b)^2$ in terms of ab . (4)**[26]****QUESTION 2**

2.1 Given the arithmetic pattern: 181 ; ... ; 9 ; 5 ; 1.

2.1.1 Determine the n^{th} term of the sequence. (2)

2.1.2 Calculate the number of terms in the sequence. (2)

2.1.3 Calculate the sum of the series $181 + \dots + 17 + 13$. (3)

2.1.4 Write the series in 2.1.3 in sigma-notation. (2)

2.2 The general term of a quadratic sequence is $T_n = an^2 - 5n + c$ It is given that $T_4 = 18$ and $T_3 = T_2 + 5$. (5)Calculate the values of a and c .**[14]**

QUESTION 3

- 3.1 A computer tablet is infected with a malware programme (computer-generated virus). It has resulted in its flat rectangular screen being affected by $\frac{1}{4}$ of the screen being blocked on the first day. On each successive day it blocks a further $\frac{1}{4}$ portion of the screen, as big as $\frac{1}{4}$ of the area it blocked on the previous day. The malware programme continues to act indefinitely. Before the infection, the area of the screen was 800 square units.

- 3.1.1 Determine the total area blocked at the end of four days (**do not round off your answer**). (3)
- 3.1.2 If the malware programme continues to act indefinitely, what fraction of the user's screen will eventually be blocked out? (2)
- 3.2 The sum of the first n terms of a geometric series $9 + 6 + 4 + \dots$ is greater than 25. Calculate the smallest value of n that will give a sum greater than 25. (6)

[11]

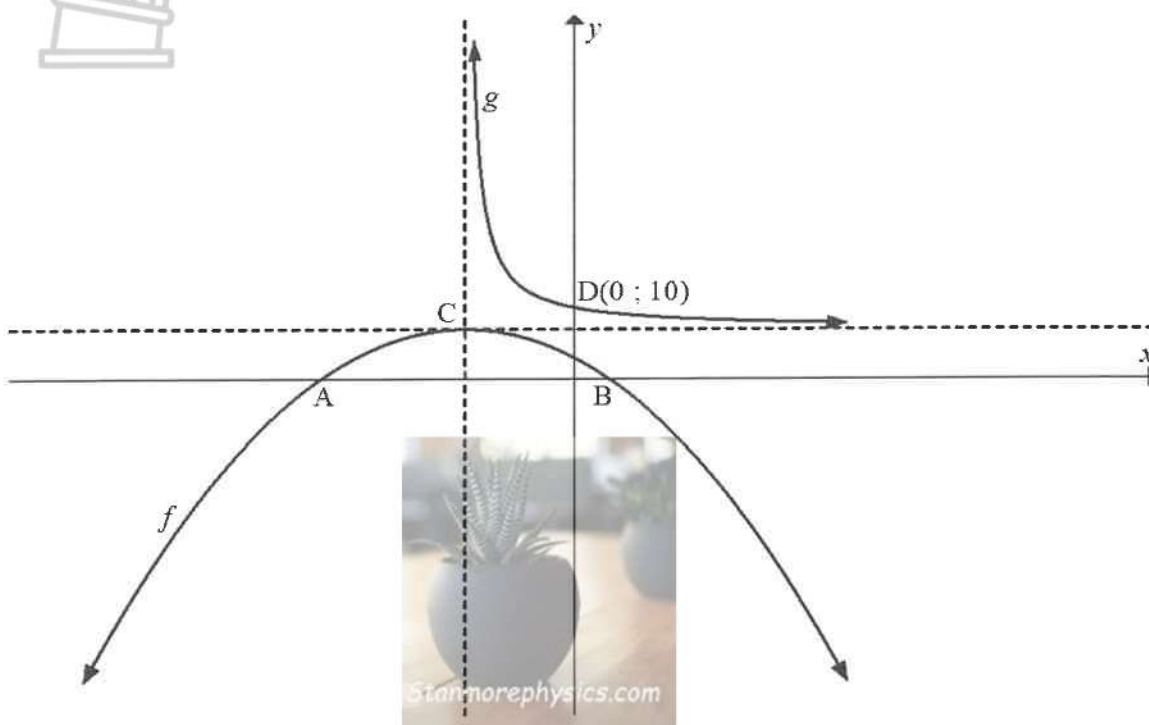


QUESTION 4

The sketch below shows the graphs of $f(x) = -x^2 - 4x + 3$ and $g(x) = \frac{a}{x-p} + q, x > p$.

A and B are x -intercepts of f . C is the turning point of f .

D(0 ; 10) is the y -intercept of g .



- 4.1 Determine the length of AB to the nearest two decimal places. (4)
- 4.2 Determine the coordinates of C. (3)
- 4.3 Find the equation of g if the asymptotes of g intersect at the turning point of f . (4)
- 4.4 Determine the values of x for which $f'(x) > 0$. (2)
- 4.5 Describe the transformation from f to h if $h(x) = x^2 + 4x - 15$. (2)
- 4.6 Determine the values of x for which $\frac{g(x)}{f(x)} \geq 0$. (2)

[17]

QUESTION 5

5.1 Consider the following function: $f(x) = \log_4 x^{\frac{3}{2}}$

5.1.1 Write down the coordinates of the x -intercept of f . (1)

5.1.2 Determine the equation of the inverse of f in the form $f^{-1}(x) = \dots\dots\dots$ (2)

5.1.3 Sketch the graphs of f and f^{-1} on the same set of axes. Clearly indicate which one is f and f^{-1} , as well as the intercepts with the axes and asymptotes.

Also sketch the axis of symmetry of f and f^{-1} AND write its equation. (5)

5.1.4 If $A(e; -2)$ is a point on f , calculate the value of e . (2)

5.1.5 Write down the domain of f . (1)

5.2 Given: $p(x) = \left(\frac{2}{3}\right)^x - 1$

5.2.1 Give the equation of t if $t(x)$ is the reflection of p in the y -axis. (2)

5.2.2 Write down the range of p . (1)

[14]

QUESTION 6

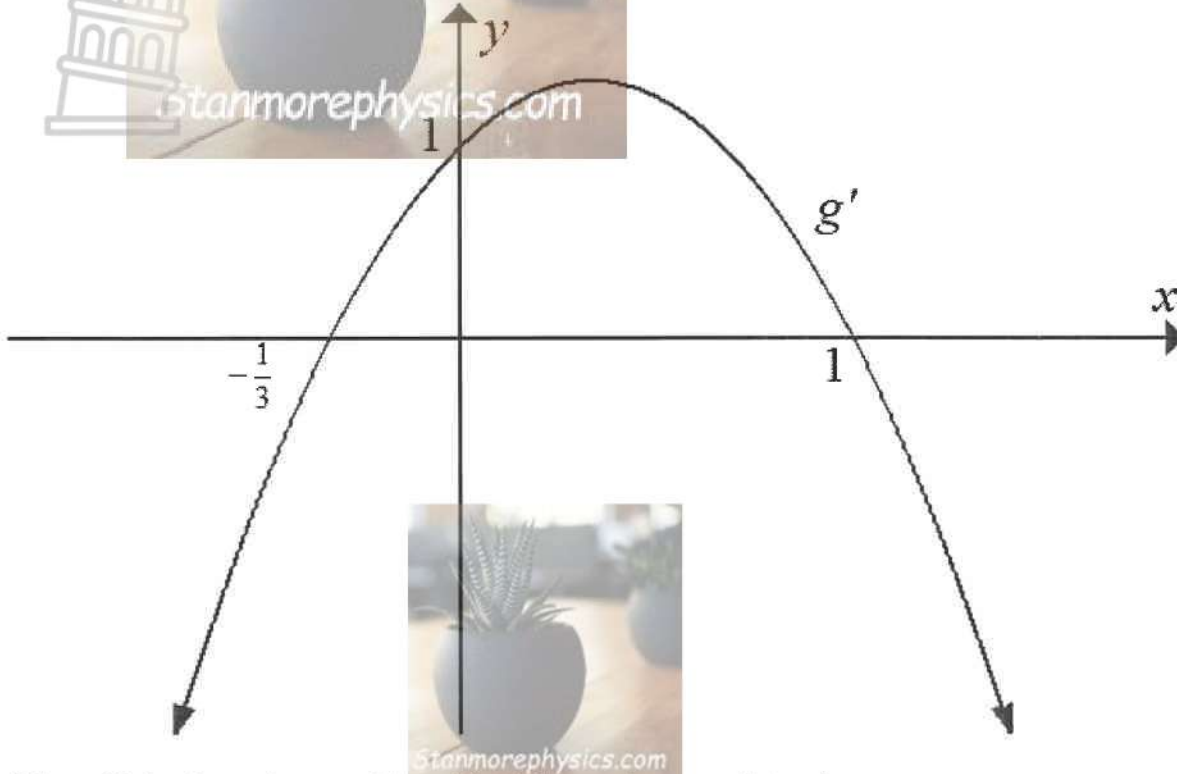
- 6.1 A machinery costing R27 000 depreciated at a rate of 13,71% p.a. Calculate the scrap value of the machinery after 7 years, on the reducing balance method. (2)
- 6.2 A loan of R800 000 is taken out at an interest rate of 13% p.a. compounded bi-annually. It is repaid by equal bi-annual payments of R57 000 and a final payment less than R57 000.
- 6.2.1 How many payments are required to settle the loan? (5)
- 6.2.2 What is the outstanding balance on the loan after the final payment of R57 000? (2)
- 6.2.3 What is the value of the final payment? (1)
- 6.3 A company sold shares at a fixed price of R765,50 per share over 4 years. A minimum guaranteed interest rate earned over the 4-year period is 7,4% per annum compounded quarterly. Charlene purchased 10 shares every quarter over the 4-year period. Her first purchase was at the beginning of the first quarter of the 4-year period, and then at the end of each quarter.
- 6.3.1 Calculate the minimum value of her investment at the end of the 4-year period. (4)
- 6.3.2 Calculate the percentage profit she made at the end of the 4-year period. (3)
- [17]

QUESTION 7

- 7.1 Given: $f(x) = -\frac{4}{x}$ (4)
- Determine $f'(x)$ from FIRST PRINCIPLES.
- 7.2 Determine:
- 7.2.1 $f'(x)$ if $f(x) = -\frac{5}{x^2} + (4x-1)\pi$ (3)
- 7.2.2 $D_x \left[\frac{\sqrt[4]{x^3} - 2x^5}{x} \right]$ (4)
- 7.2.3 $\frac{dy}{dx}$ if $y = (x^2 - x - 6)(x-3)^{-1}$ (2)
- [13]

QUESTION 8

The diagram below shows the graph of $y = g'(x)$ where $g(x) = ax^3 + bx^2 + cx + d$. The graph of $g'(x)$ cuts the y -axis at $(0; 1)$ and the x -axis at $\left(-\frac{1}{3}; 0\right)$ and $(1; 0)$.



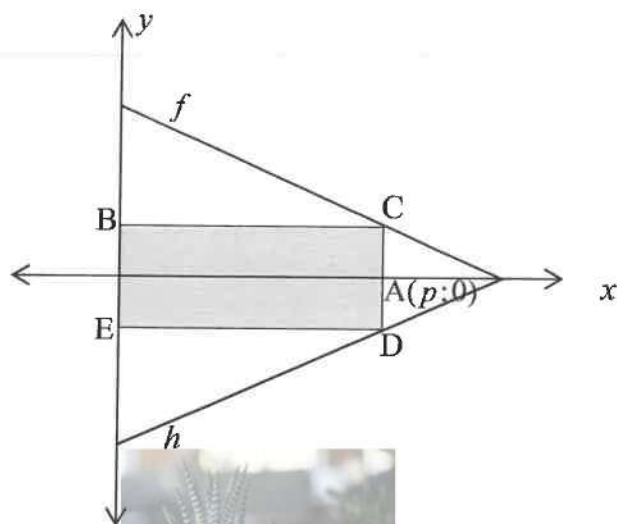
- 8.1 Write down the coordinate(s) of the stationary points of g . (2)
- 8.2 Determine the x -coordinate of the point of inflection of g . (2)
- 8.3 Determine the values of x for which the function of g is increasing. (2)
- 8.4 Determine the equation of g' in the form $g'(x) = px^2 + qx + r$. (4)
- 8.5 Given that :
- $g(x) + 1$ passes through point $(0; 0)$
 - $g'(x) = -3x^2 + 2x + 1$

Show that for $g(x)$, $a = -1$, $b = 1$, $c = 1$ and $d = -1$. (5)

[15]

QUESTION 9

The rectangle below extends from the origin to point $A(p;0)$. It touches the graph of $f(x) = -4x + 8$ at point C and the graph of $h(x) = 4x - 8$ at point D.



- 9.1 Show that the area of the shaded rectangle can be expressed as $A(p) = -8p^2 + 16p$. (3)
- 9.2 Determine the maximum area of the shaded region. (5)

[8]

QUESTION 10

10.1 For two events, A and B, in the sample space S, it is given that $P(A) = 0,45$;
 $P(B) = 0,7$ and $P(A \text{ and } B) = 0,25$.

10.1.1 Draw a Venn-diagram to represent the information. (3)

10.1.2 Determine $P(A' \text{ and } B)$. (1)

10.1.3 Determine $P(A' \text{ or } B)$. (1)

10.1.4 Are events A and B independent? Motivate your answer with the necessary calculations. (3)

10.2 Nine coins are arranged in a row.

- Four are R1 coins
- Three are R2 coins
- Two are R5 coins

10.2.1 How many different arrangements are possible, if all the coins of the same value are identical? (3)

10.2.2 How many different arrangements are possible, if the arrangement must start and end with a R2 coin? (3)

10.2.3 What is the probability that an arrangement will start and end with a R2 coin? (1)

[15]

TOTAL MARKS: 150

INFORMATION SHEET

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$A = P(1 + in)$$

$$A = P(1 - in)$$

$$A = P(1 - i)^n$$

$$A = P(1 + i)^n$$

$$T_n = a + (n - 1)d$$

$$S_n = \frac{n}{2}[2a + (n - 1)d]$$

$$T_n = ar^{n-1}$$

$$S_n = \frac{a(r^n - 1)}{r - 1}; r \neq 1$$

$$S_\infty = \frac{a}{1 - r}; -1 < r < 1$$

$$F = \frac{x[(1 + i)^n - 1]}{i}$$

$$P = \frac{x[1 - (1 + i)^{-n}]}{i}$$

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x + h) - f(x)}{h}$$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$M\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$$

$$y = mx + c$$

$$y - y_1 = m(x - x_1)$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \tan \theta$$

$$(x - a)^2 + (y - b)^2 = r^2$$

$$\text{In } \triangle ABC: \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cdot \cos A$$

$$\text{Area of } \triangle ABC = \frac{1}{2}ab \cdot \sin C$$

$$\sin(\alpha + \beta) = \sin \alpha \cdot \cos \beta + \cos \alpha \cdot \sin \beta$$

$$\cos(\alpha + \beta) = \cos \alpha \cdot \cos \beta - \sin \alpha \cdot \sin \beta$$

$$\sin(\alpha - \beta) = \sin \alpha \cdot \cos \beta - \cos \alpha \cdot \sin \beta$$

$$\cos(\alpha - \beta) = \cos \alpha \cdot \cos \beta + \sin \alpha \cdot \sin \beta$$

$$\cos 2\alpha = \begin{cases} \cos^2 \alpha - \sin^2 \alpha \\ 1 - 2\sin^2 \alpha \\ 2\cos^2 \alpha - 1 \end{cases}$$

$$\sin 2\alpha = 2\sin \alpha \cdot \cos \alpha$$

$$\bar{x} = \frac{\sum fx}{n}$$

$$\sigma^2 = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n}$$

$$P(A) = \frac{n(A)}{n(S)}$$

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$\hat{y} = a + bx$$

$$b = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sum (x - \bar{x})^2}$$

NSC Answer Book
NSS-Antwoordeboek

SCHOOL NAME <i>SKOOL NAAM</i>		DISTRICT <i>DISTRIK</i>	
SURNAME AND NAME <i>VAN EN NAAM</i>		CLASS <i>KLAAS</i>	
DATE <i>DATUM</i>			
SUBJECT NAME <i>VAKNAAM</i>	MATHEMATICS P1/WISKUNDE V1		

[illegible]

CONTROLLED AND CERTIFIED CORRECT
(SURNAME AND INITIALS OF EA)
GEKONTROLEER EN AS KORREK GESERTIFISEER (VAN
EN VOORLETTERS VAN EA)

READ INSTRUCTIONS ON THE NEXT PAGE.
LEES INSTRUKSIES OP DIE VOLGENDE BLADSY.

This answer book consists of 22 pages/Hierdie antwoordeboek bestaan uit 22 bladsye.

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Please turn over/*Blaai om asseblief*

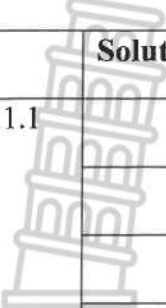
PLEASE FOLLOW THESE INSTRUCTIONS CAREFULLY

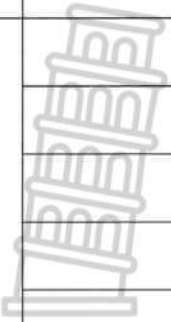
VOLG ASSEBLIEF HIERDIE INSTRUKSIES NOUKEURIG

1. Your name, surname, school and class must be clearly written in the space provided.
2. Answer ALL questions in the spaces provided.
3. No pages may be torn from this answer book.
4. Read the instructions printed on your timetable carefully as well as any other instructions which may be given in each examination paper.
5. Candidates may not retain an answer book or remove it from the examination room. Answer books must be returned to the Invigilator at the end of the examination session.
6. Answers must be written in black/blue ink as distinctly as possible. Do NOT write in the margins.
7. Indicate the questions you have answered by drawing a circle around the relevant numbers on the front cover of the answer book where marks are to be recorded.
8. Draw a neat line through any work/rough work that must not be marked.
9. In the event that you use the additional space provided at the end of this ANSWER BOOK:
 - 9.1 Write down the question number.
 - 9.2 Leave a line and rule off after your answer.

1. Skryf jou naam, van, skool en klas duidelik in die ruimtes verskaf.
2. Beantwoord ALLE vrae in die ruimtes wat verskaf is.
3. Geen bladsye mag uit hierdie antwoordeboek geskeur word nie.
4. Lees die instruksies wat op jou eksamenrooster gedruk is sorgvuldig deur, asook enige ander instruksies wat in elke eksamenvraestel gegee word.
5. Geen antwoordeboek mag deur die kandidaat behou of uit die eksamenlokaal verwyder word nie. Antwoordeboeke moet aan die einde van die eksamensessie aan die toesighouer terugbesorg word.
6. Skryf die antwoorde so duidelik moontlik met swart/blou ink. MOENIE in die kantlyne skryf NIE.
7. Dui die vrae wat jy beantwoord het op die voorblad van die antwoordeboek aan, waar die punte aangebring word, deur 'n kringetjie om die nommers van die vrae wat jy beantwoord het, te trek.
8. Trek 'n netjiese lyn deur enige werk/rofwerk wat nie nagesien moet word nie.
9. In geval jy die bykomende ruimte wat aan die einde van hierdie ANTWOORDEBOEK verskaf is, gebruik:
 - 9.1 Skryf die vraagnommer neer
 - 9.2 Laat 'n lyn oop en trek 'n lyn na jou antwoord.

QUESTION 1/VRAAG 1

	Solution/Oplossing	Marks Punte
1.1.1		(2)
1.1.2		
1.1.3		(4)

	Solution/Oplissing	Marks Punte
1.1.4		
1.1.5		(3)
		(4)

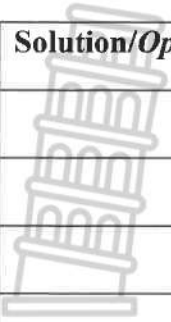
	Solution/Oplissing	Marks Punte
1.2	 	(6)
1.3		(4)
		[26]

QUESTION 2/VRAAG 2

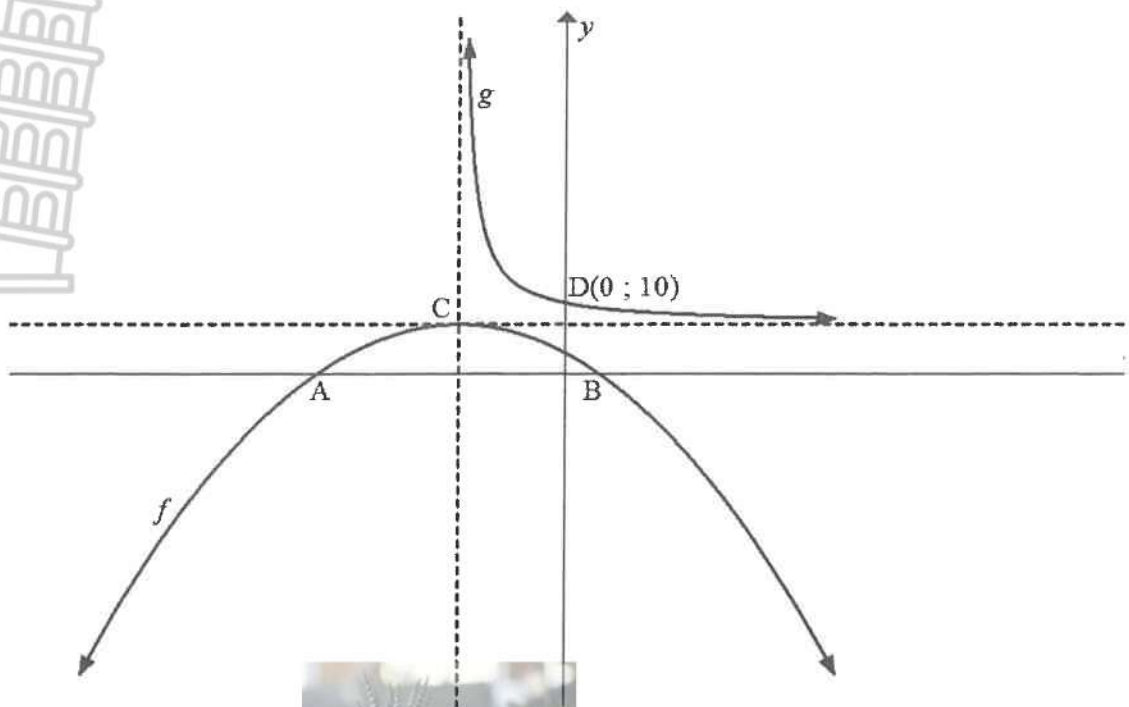
	Solution/Oplissing	Marks Punte
2.1.1		(2)
2.1.2		(2)
2.1.3		(3)

	Solution/Oplissing	Marks Punte
2.1.4		(2)
2.2		
		(5) [14]

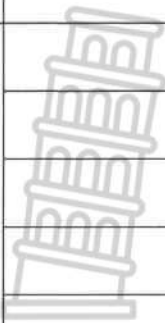
QUESTION/VRAAG 3

	Solution/Oplissing	Marks Punte
3.1.1		(3)
3.1.2		(2)
3.2		(6)
		[11]

QUESTION/VRAAG 4



	Solution/Oplossing	Marks Punte
4.1		
		(4)

	Solution/Oplissing	Marks Punte
4.2		(3)
4.3		(4)
4.4		(2)
4.5		(2)
4.6		(2)
		[17]

QUESTION 5/VRAAG 5

	Solution/Oplissing	Marks Punte
5.1.1		(1)
5.1.2		(2)
5.1.3		(5)
5.1.4		(2)

	Solution/Oplissing	Marks Punte
5.1.5		(1)
5.2.1		(2)
5.2.2		(1)
		[14]

QUESTION 6/VRAAG 6

	Solution/Oplissing	Marks Punte
6.1		(2)

	Solution/Oplissing	Marks Punte
6.2.1		
6.2.2	 Stanmorephysics.com	(5)
6.2.3		(2)
		(1)

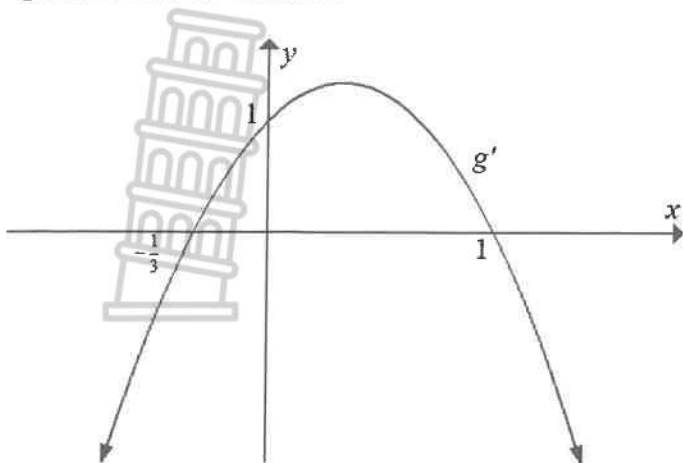
	Solution/Oplissing	Marks Punte
6.3.1		(4)
6.3.2		(3)
		[17]

QUESTION/VRAAG 7

	Solution/Oplissing	Marks Punte
7.1		(4)
7.2.1		(3)

	Solution/Oplissing	Marks Punte
7.2.2	  Stanmorephysics.com	(4)
7.2.3		(2)
		[13]

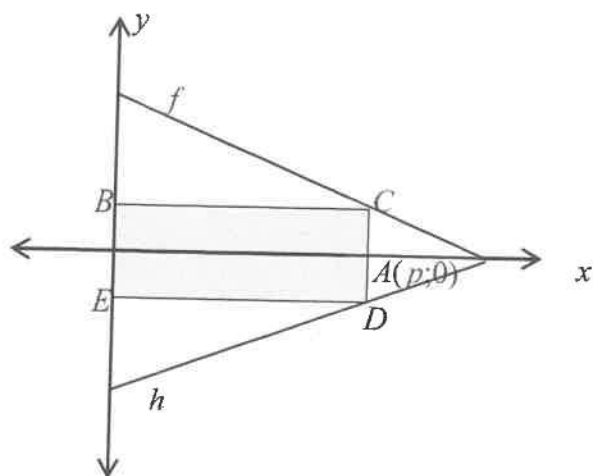
QUESTION 8/VRAAG 8



	Solution/Oplissing	Marks Punte
8.1		(2)
8.2		(2)
8.3		(2)

	Solution/ <i>Oplossing</i>	Marks <i>Punte</i>
8.4		(4)
8.5	 Stanmorephysics.com	(5)
		[15]

QUESTION 9/VRAG 9



	Solution/Oplissing	Marks Punte
9.1		(3)
9.2		
		(5)
		[8]

QUESTION 10/VRAAG 10

	Solution/Oplossing	Marks Punte
10.1.1	 Stanmorephysics.com	(3)
10.1.2		(1)
10.1.3		(1)
10.1.4		(3)

	Solution/Oplissing	Marks Punte
10.2.1		(3)
10.2.2		(3)
10.2.3		(1)
		[15]

ADDITIONAL SPACE/ADDISIONELE SPASIE

Soluti

[illegible]**TOTAL/TOTAAL: 150**

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education

MPUMALANGA PROVINCE
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE**

**NASIONALE SENIOR
SERTIFIKAAT**

GRADE 12 / GRAAD 12

MATHEMATICS P1 / WISKUNDE V1

SEPTEMBER 2025

MARKING GUIDELINE / NASIENRIGLYN

MARKS / PUNTE: 150

The marking guideline consists of 12 pages.

Die nasienriglyn bestaan uit 12 bladsye.

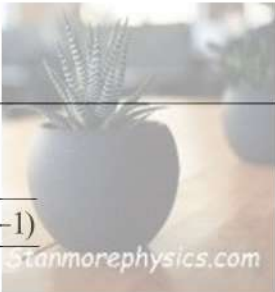
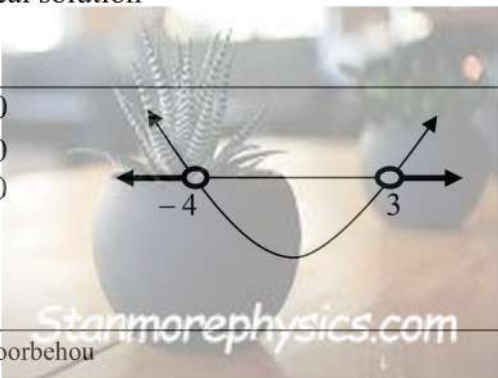
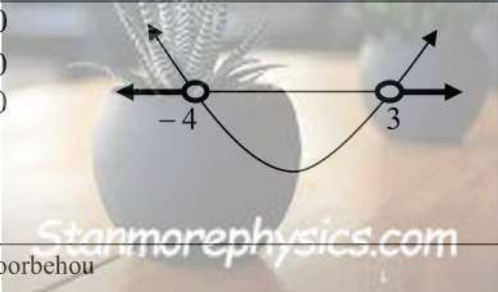
TAKE NOTE:

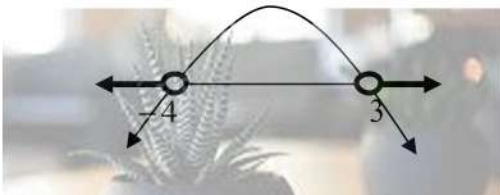
- If a candidate answered a question TWICE, mark only the FIRST attempt.
- If a candidate crossed out an answer and did not redo it, mark the crossed-out answer.
- Consistent accuracy applies to ALL aspects of the marking guideline.
- Assuming values/answers in order to solve a problem is unacceptable.

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.

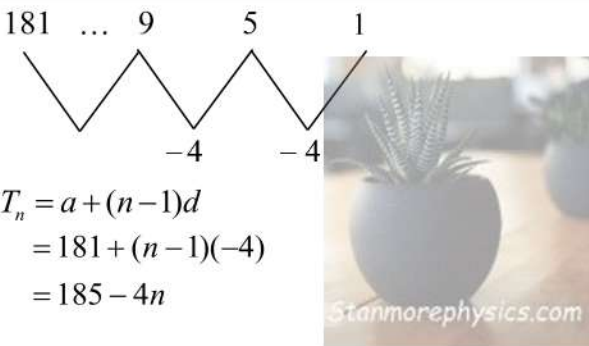
QUESTION 1 / VRAAG 1

1.1.1	$6x^2 - 2x = 0$ $2x(3x - 1) = 0$ $x = 0 \text{ or } x = \frac{1}{3}$		✓ factors/faktore ✓ both answers/albei antwoorde (2)
1.1.2	$2x^2 = 1 - 4x$ $2x^2 + 4x - 1 = 0$ $x = \frac{-(4) \pm \sqrt{(4)^2 - 4(2)(-1)}}{2(2)}$ $x = 0,22 \text{ or } x = -2,22$		✓ standard form / standaard vorm ✓ substitution into correct formula / vervanging in korrekte formule ✓ answers/antwoorde (3)
1.1.3	$\sqrt{x-2} + 4 = x$ $\sqrt{x-2} = x-4$ $(\sqrt{x-2})^2 = (x-4)^2$ $x-2 = x^2 - 8x + 16$ $x^2 - 9x + 18 = 0$ $(x-6)(x-3) = 0$ $x = 6 \text{ or } x = 3$		✓ rewrite and squaring / herskryf en kwadrering ✓ standard form / standaard vorm ✓ factors / faktore ✓ both answers with exclusion / beide antwoorde met uitsluiting (4)
1.1.4	$3^{4x} - 8 \cdot 3^{2x} - 9 = 0$ $(3^{2x} - 9)(3^{2x} + 1) = 0$ $3^{2x} = 9 \text{ or } 3^{2x} = -1$ $2x = 2 \quad \text{No real solution}$ $x = 1$		✓ factors / faktore ✓ both equations / beide vergelykings ✓ both answers with exclusion / beide antwoorde met uitsluiting (3)
1.1.5	$-x^2 - x + 12 < 0$ $x^2 + x - 12 > 0$ $(x+4)(x-3) > 0$ $x < -4 \text{ or } x > 3$		✓ standard form / standaard vorm ✓ critical values/kritieke waardes ✓ answer/antwoord (4)

	OR / OF $-x^2 - x + 12 < 0$ $(-x+3)(x+4) < 0$ $x < -4 \text{ or } x > 3$ 	✓ standard form / standaard vorm ✓ critical values/kritieke waardes ✓✓ answer/antwoord (4)
1.2	$x - y = 3$ and $x^2 - xy - 2y^2 = 10$ $x = y + 3$(1) $x^2 - xy - 2y^2 = 10$(2) $(y+3)^2 - (y+3)y - 2y^2 = 10$ subst. (1) in (2) $y^2 + 6y + 9 - y^2 - 3y - 2y^2 - 10 = 0$ $-2y^2 + 3y - 1 = 0$ $2y^2 - 3y + 1 = 0$ $(2y-1)(y-1) = 0$ $y = \frac{1}{2} \text{ or } y = 1$ $x = \frac{1}{2} + 3 \text{ or } x = 1 + 3$ $x = 3\frac{1}{2} \text{ or } x = 4$ OR/OF $x - y = 3$ $y = x - 3$ $x^2 - x(x-3) - 2(x-3)^2 = 10$ $x^2 - x^2 + 3x - 2(x^2 - 6x + 9) = 10$ $3x - 2x^2 + 12x - 18 = 10$ $-2x^2 + 15x - 28 = 0$ $2x^2 - 15x + 28 = 0$ $(2x-7)(x-4) = 0$ $x = \frac{7}{2} \text{ or } x = 4$ $y = \frac{1}{2} \text{ or } y = 1$	✓ $x = y + 3$ ✓ substitution/inervanging ✓ standard form / standaard vorm ✓ factorising/faktoriseren ✓ both y-values / beide y-waardes ✓ both values of x / beide x-waardes (6) ✓ $y = x - 3$ ✓ substitution/inervanging ✓ standard form / standaard vorm ✓ factorising/faktoriseren ✓ both x-values / beide x-waardes ✓ both values of y-values / beide y-waardes (6)

1.3	$(a+b)(a-b) = 2b(8a-b), a > 0, b > 0$ $a^2 - b^2 = 16ab - 2b^2$ $a^2 + b^2 = 16ab$ $(a+b)^2 = a^2 + 2ab + b^2$ $= 16ab + 2ab$ $= 18ab$	✓ expansion/uitbreiding ✓ isolating/soleer $a^2 + b^2$ ✓ expansion / uitbreiding ✓ answer/antwoord (4)
		[26]

QUESTION 2 / VRAAG 2

2.1.1	 $T_n = a + (n-1)d$ $= 181 + (n-1)(-4)$ $= 185 - 4n$	✓ subst of a and d into correct formula / vervang a en d in korrekte formule ✓ T_n (2)
2.1.2	$1 = 185 - 4n$ $-184 = -4n$ $n = 46$	✓ substituting 1/ vervang 1 ✓ answer/antwoord (2)
2.1.3	$181 + \dots + 17 + 13 \quad (+9 + 5 + 1)$ $\therefore n = 46 - 3 = 43$ terms $S_n = \frac{n}{2}(a+l)$ $= \frac{43}{2}(181+13)$ $= 4\,171$ OR/OF $S_n = \frac{n}{2}[2a + (n-1)d]$ $= \frac{43}{2}[2(181) + (43-1)(-4)]$ $= 4\,171$	✓ 43 terms/terme ✓ correct subst into correct formula / korrekte invang in korrekte formule ✓ answer/antwoord (3)
2.1.4	$\sum_{n=1}^{43} (185 - 4n)$	✓ $\sum_{n=1}^{43}$ ✓ $(185 - 4n)$ (2)

2.2	$T_n = an^2 - 5n + c$ $T_4 = a(4)^2 - 5(4) + c$ $= 16a - 20 + c = 18$ $T_3 = a(3)^2 - 5(3) + c$ $= 9a - 15 + c$ $T_2 = a(2)^2 - 5(2) + c$ $= 4a - 10 + c$ $9a - 15 + c = 4a - 10 + c + 5$ $5a = 10$ $a = 2$ $T_4 = 16(2)^2 - 20 + c = 18$ $c = -26$	✓ T_4 ✓ T_3 and/en T_2 ✓ equation/vergelyking ✓ value of a/waarde van a ✓ value of c/waarde van c (5)
		[14]

QUESTION 3 / VRAAG 3

3.1.1	$\frac{800}{4} + \left(\frac{800}{4}\right)\frac{1}{4} + \left(\frac{800}{4}\right)\frac{1}{4}\frac{1}{4} + \left(\frac{800}{4}\right)\frac{1}{4}\frac{1}{4}\frac{1}{4}$ $\frac{800}{4} + \left(\frac{800}{4}\right)\left(\frac{1}{4}\right) + \left(\frac{800}{4}\right)\left(\frac{1}{4}\right)\left(\frac{1}{4}\right) + \left(\frac{800}{4}\right)\left(\frac{1}{4}\right)\left(\frac{1}{4}\right)\left(\frac{1}{4}\right)$ $= 200 + 50 + 12,5 + 3,125$ $= 265,625 \text{ squared units / vierkante eenhede}$	✓ a ✓ r ✓ answer/antwoord (3)
3.1.2	$S_{\infty} = \frac{200}{1 - 0,25}$ $= \frac{800}{3}$ $= 266,67 \text{ squared units / vierkante eenhede}$	✓ substitution of a and r into correct formula / vervanging in korrekte formule ✓ answer/antwoord (2)
3.2	$a = 9, \quad r = \frac{6}{9} = \frac{2}{3}$ $S_n = \frac{9 \left[1 - \left(\frac{2}{3} \right)^n \right]}{1 - \frac{2}{3}} > 25$ $27 \left[1 - \left(\frac{2}{3} \right)^n \right] > 25$	✓ substitution into correct formula / vervanging in korrekte formule

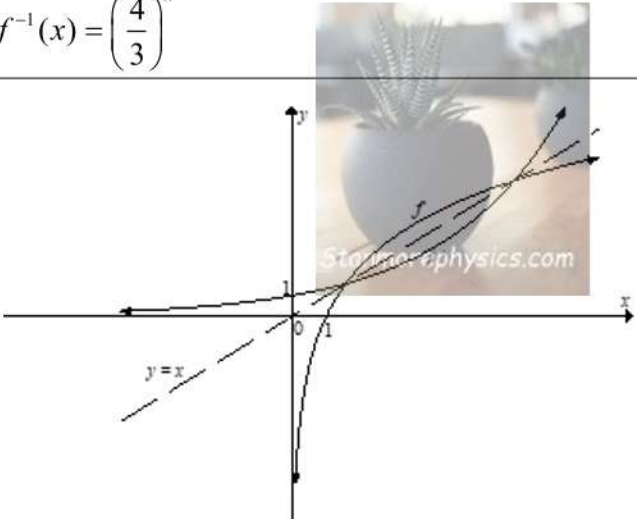
$27 - 27\left(\frac{2}{3}\right)^n > 25$ $-27\left(\frac{2}{3}\right)^n > -2$ $\left(\frac{2}{3}\right)^n > \frac{2}{27}$ $n \log\left(\frac{2}{3}\right) > \log\left(\frac{2}{27}\right)$ $n > \log\left(\frac{2}{27}\right) \div \log\left(\frac{2}{3}\right)$ $n > 6,419\dots$ $n = 7$	$\checkmark > 25$ $\checkmark$ simplification / vereenvoudiging $\checkmark$ use of logs / gebruik van logs $\checkmark n > 6,419$ $\checkmark n = 7$ (6)
	[11]

QUESTION 4 / VRAAG 4

4.1	$f(x) = -x^2 - 4x + 3 = 0$ $x^2 + 4x - 3 = 0$ $x = \frac{-4 \pm \sqrt{(4)^2 - 4(1)(-3)}}{2(1)}$ $x = 0,645 \text{ or } x = -4,645$ $AB = 0,645 - (-4,645)$ $= 5,29 \text{ units}$	$\checkmark$ substitution into formula / vervanging in korrekte formule $\checkmark$ x-values / x - waardes $\checkmark$ length of / lengte van AB $\checkmark$ answer/antwoord (4)
4.2	$x = \frac{-4,645 + 0,645}{2} = -2 \quad \text{OR/OF} \quad f'(x) = -2x - 4 = 0$ $x = -2$ $f(-2) = -(-2)^2 - 4(-2) + 3$ $= 7$ $C(-2; 7)$	$\checkmark$ x-value / x-waarde $\checkmark$ y-value / y-waarde $\checkmark C(-2; 7)$ (3)
4.3	$10 = \frac{a}{0+2} + 7$ $a = 6$ $g(x) = \frac{6}{x+2} + 7; \quad x > -2$	$\checkmark$ substitution / vervanging $\checkmark a = 6$ $\checkmark$ equation / vergelyking $\checkmark x > -2$ (4)
4.4	$x < -2$	$\checkmark \checkmark$ answer/antwoord (2)

4.5	Reflection in x -axis and translation of 12 units down. Refleksie in x -as en translasie van 12 eenhede af.	✓ reflection in x -axis / refleksie in x -as ✓ 12 units down / 12 eenhede af (2)
4.6	$-2 < x < 0,645$	✓ end points / eindpunte ✓ notation / notasie (2)
		[17]

QUESTION 5 / VRAAG 5

5.1.1	(1 ; 0)	✓ answer / antwoord (1)
5.1.2	$x = \log_{\frac{4}{3}} y$ $f^{-1}(x) = \left(\frac{4}{3}\right)^x$	✓ interchanging x and y / ruil x en y ✓ answer / antwoord (2)
5.1.3		✓ shape of f / vorm van f ✓ shape of f^{-1} / vorm van f^{-1} ✓ x - and y -intercepts / x en y afsnitte ✓ asymptotes / asimptote ✓ symmetry-axis and its equation / simmetrie as (5)
5.1.4	$-2 = \log_{\frac{4}{3}} x$ $x = \left(\frac{4}{3}\right)^{-2}$ $= \frac{9}{16}$ $e = \frac{9}{16}$	✓ substitution / vervanging ✓ answer / antwoord (2)
5.1.5	$x > 0, x \in R$	✓ answer / antwoord (1)
5.2.1	$t(x) = \left(\frac{2}{3}\right)^{-x} - 1$ OR/OF $t(x) = \left(\frac{3}{2}\right)^x - 1$	✓ $\left(\frac{2}{3}\right)^{-x}$ or $\left(\frac{3}{2}\right)^x$ ✓ -1 (2)
5.2.2	$y > -1, y \in R$	✓ answer / antwoord (1)

QUESTION 6 / VRAAG 6

6.1.	$A = P(1-i)^n$ $= 27\,000(1-0,1371)^7$ $= R\,9\,618,05$	✓ substitution into correct formula / vervanging in korrekte formule ✓ answer/antwoord (2)
6.2.1	$P = \frac{x[1-(1+i)^{-n}]}{i}$ $800\,000 = \frac{57\,000 \left[1 - \left(1 + \frac{0,13}{2} \right)^{-n} \right]}{\frac{0,13}{2}}$ $\frac{800\,000 \left(\frac{0,13}{2} \right)}{57\,000} - 1 = - \left(1 + \frac{0,13}{2} \right)^{-n}$ $\frac{5}{57} = \left(1 + \frac{0,13}{2} \right)^{-n}$ $-n = \frac{\log \frac{5}{57}}{\log \left(1 + \frac{0,13}{2} \right)}$ $= -38,64424163$ $n = 38,64424163$ $n = 39 \text{ payments/betalings}$	✓ substitution into correct formula / vervang in korrekte formule ✓ simplification / verrenvoudiging ✓ correct use of logs / korrekte gebruik van logs ✓ 38,644... ✓ 39 payments / betalings (5)
6.2.2	$OB = \frac{57\,000 \left[1 - \left(1 + \frac{0,13}{2} \right)^{-0,64424163} \right]}{\frac{0,13}{2}}$ $= R\,34\,865,59$	✓ substitution into correct formula / vevang in korrekte formule ✓ answer/antwoord (2)
6.2.3	Final payment / Finale betaling $= 34\,865,59 \left(1 + \frac{0,13}{2} \right)^1$ $= R\,37\,131,85$	✓ answer/antwoord (1)

6.3.1	$x = 765,5 \times 10 = 7\,655,00$ $F = \frac{7655 \left[\left(1 + \frac{0,074}{4} \right)^{17} - 1 \right]}{\frac{0,074}{4}}$ $= R151\,297,64$	✓ x ✓ substitution in correct formula / vervanging in korrekte formule $\frac{0,074}{4}$ and/en ✓ 17 ✓ R151 297,64 (4)
6.3.2	Profit/Wins = $151\,297,64 - (7655 \times 17)$ $= R\,21\,162,64$ % Profit /wins = $\frac{21\,162,64}{7655 \times 17} \times 100$ $= 16,26\%$	✓ profit = total accumulated – total paid / Wins = totaal geakkumuleer – totaal betaal ✓ $7\,655 \times 17$ ✓ answer/antwoord (3)
		[17]

QUESTION 7 / VRAAG 7

7.1	$f(x) = -\frac{4}{x}$ $f(x+h) = -\frac{4}{x+h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{\frac{-4}{x+h} - \left(\frac{-4}{x}\right)}{h}$ $= \lim_{h \rightarrow 0} \frac{\frac{-4x + 4x + 4h}{x(x+h)}}{h}$ $= \lim_{h \rightarrow 0} \frac{4h}{x(x+h)} \times \frac{1}{h}$ $= 4x^{-2} = \frac{4}{x^2}$	✓ correct substitution into formula and notation / korrekte vervanging in korrekte formule met notasie ✓ simplification / vereenvoudiging ✓ $\lim_{h \rightarrow 0} \frac{4h}{x(x+h)} \times \frac{1}{h}$ ✓ answer/antwoord (4)
7.2.1	$f(x) = -\frac{5}{x^2} + (4x-1)\pi$ $= -5x^{-2} + 4\pi x - \pi$ $f'(x) = 10x^{-3} + 4\pi + 0$	✓ simplification / vereenvoudig ✓ $10x^{-3}$ ✓ 4π (3)

7.2.2	$D_x \left[\frac{\sqrt[4]{x^3} - 2x^5}{x} \right]$ $= D_x \left[\frac{x^{\frac{3}{4}} - 2x^5}{x} \right]$ $= D_x \left[x^{-\frac{1}{4}} - 2x^4 \right]$ $= -\frac{1}{4}x^{-\frac{5}{4}} - 8x^3$	$\checkmark \sqrt[4]{x^3} = x^{\frac{3}{4}}$ $\checkmark x^{-\frac{1}{4}} - 2x^4$ $\checkmark -\frac{1}{4}x^{-\frac{5}{4}}$ $\checkmark -8x^3$ (4)
7.2.3	$y = \frac{x^2 - x - 6}{x - 3}$ $= \frac{(x-3)(x+2)}{x-3}$ $= x+2$ $\frac{dy}{dx} = 1$	$\checkmark$ factorisation/faktorisering $\checkmark$ derivative/afgeleide (2)
		[13]

QUESTION 8 / VRAAG 8

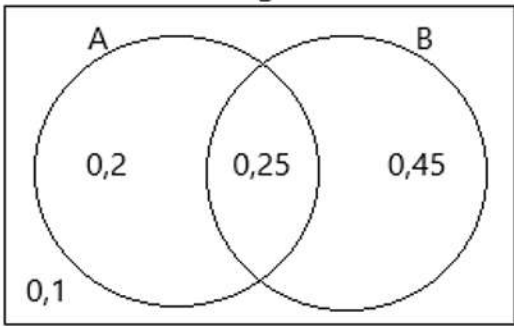
8.1	$x = -\frac{1}{3} \text{ or } x = 1$	$\checkmark \checkmark$ x-values /waardes (2)
8.2	$x = \frac{1 - \frac{1}{3}}{2}$ $x = \frac{1}{3}$	$\checkmark$ midpoint / middelpunt $\checkmark x = \frac{1}{3}$ (2)
8.3	$x \in \left(-\frac{1}{3}; 1\right)$ OR $-\frac{1}{3} < x < 1$	$\checkmark \checkmark$ answer (2)
8.4	$y = a\left(x + \frac{1}{3}\right)(x-1)$ $1 = a\left(\frac{1}{3}\right)(0-1)$ $a = -3$ $y = -3\left(x + \frac{1}{3}\right)(x-1)$ $g'(x) = -3x^2 + 2x + 1$	$\checkmark$ substitution / vervanging $\checkmark$ substituting / vervang (0;1) $\checkmark$ value of a / waarde van a $\checkmark$ answer/antwoord (4)

8.5	$g(x) + 1 = ax^3 + bx^2 + cx + d + 1$ $0 = a(0)^3 + b(0)^2 + c(0) + d + 1$ $0 = d + 1$ $d = -1$ $g(x) = ax^3 + bx^2 + cx - 1$ $g'(x) = 3ax^2 + 2bx + c$ $\quad = -3x^2 + 2x + 1$ $\therefore 3a = -3 \quad 2b = 2 \quad c = 1$ $a = -1 \quad b = 1$	✓ $g(x) + 1$ ✓ substitute / vervang (0 ; 0) ✓ $g'(x) = 3ax^2 + 2bx + c$ ✓ equating derivatives / vergelyking van afgeleides ✓ equating coefficients vergelyking van koëffisiënte (5)
		[15]

QUESTION 9 / VRAAG 9

9.1	Breadth of the rectangle / breedte van reghoek $CD = -4p + 8 - (4p - 8)$ $= -8p + 16$ $Area = l \times b$ $= p(-8p + 16)$ $A(p) = -8p^2 + 16p$	 ✓ difference / verskil ✓ breadth in terms of p / breedte in terme van p ✓ Substitution / vervanging (3)
9.2	$A'(p) = 0$ $-16p + 16 = 0$ $\therefore p = 1$ $A(1) = -8(1)^2 + 16(1)$ $= 8 \text{ units}^2 / \text{vierkante eenhede}$	✓ $A'(p) = 0$ ✓ $-16p + 16$ ✓ value of p ✓ substitution ✓ answer (5)
		[8]

QUESTION 10 / VRAAG 10

10.1.1		✓ 0,2 and 0,25 ✓ 0,45 ✓ 0,1 (3)
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NSC Marking Guideline/NSS/Nasienriglyn

10.1.2	$P(A' \text{ and/en } B) = 0,45$	✓ answer/antwoord (1)
10.1.3	$P(A' \text{ or/of } B) = 0,8$	✓ answer/antwoord (1)
10.1.4	$P(A \text{ and/en } B) = 0,25$ $P(A) \times P(B) = 0,45 \times 0,7 = 0,315$ $P(A \text{ and/en } B) \neq P(A) \times P(B)$ $\therefore$ Not independent / nie onafhanklik	✓ 0,315 ✓ $\neq$ ✓ conclusion / gevolgtrekking (3)
10.2.1	$\frac{9!}{4! 3! 2!} = 1\,260$	✓ numerator/teller ✓ denominator/noemer ✓ answer/antwoord (3)
10.2.2	$\frac{3 \times 7! \times 2}{4! 2!} = 630$	✓ numerator/teller ✓ denominator/noemer ✓ answer/antwoord (3)
10.2.3	$\frac{630}{1260} = \frac{1}{2}$	✓ answer/antwoord (1)
		[15]

TOTAL / TOTAAL: 150