



DEPARTMENT OF EDUCATION
DEPARTEMENT VAN ONDERWYS
LEFAPHA LA THUTO
ISEBE LEZEMFUNDO

**PROVINSIALE VOORBEREIDENDE EKSAMEN/
PROVINCIAL PREPARATORY EXAMINATION**

GRAAD/GRADE 12

WISKUNDE/MATHEMATICS

VRAESTEL/PAPER 1

SEPTEMBER 2025

PUNTE/MARKS: 150

TYD/TIME: 3 uur/hours

**Hierdie vraestel bestaan uit 9 bladsye, 1 inligtingsblad
en 'n 23 bladsy- SPESIALE ANTWOORDEBOEK./
This question paper consists of 9 pages, 1 information sheet
and a 23-page SPECIAL ANSWER BOOK.**

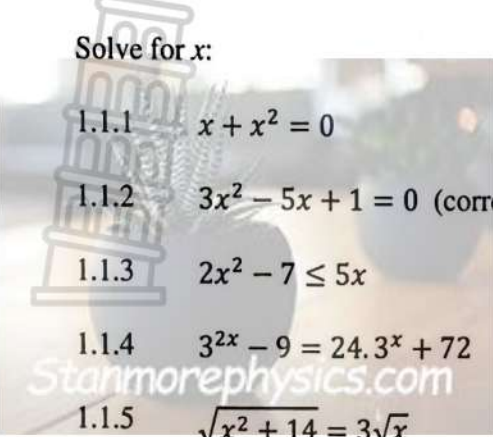
INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 11 questions.
2. Answer ALL the questions in the SPECIAL ANSWER BOOK provided.
3. Clearly show ALL calculations, diagrams, graphs, etc. which you have used in determining your 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 correct 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 1

1.1 Solve for x :



1.1.1 $x + x^2 = 0$ (2)

1.1.2 $3x^2 - 5x + 1 = 0$ (correct to TWO decimal places) (3)

1.1.3 $2x^2 - 7 \leq 5x$ (4)

1.1.4 $3^{2x} - 9 = 24.3^x + 72$ (4)

1.1.5 $\sqrt{x^2 + 14} = 3\sqrt{x}$ (4)

1.2 Solve for x and y simultaneously:

$5x - y = 4$ and $x^2 - x + y^2 = 4 - 3y$ (5)

1.3 Determine, without using a calculator, the value of k in:

$4^{24} + 8^{16} + 16^{12} + 64^8 = 2^k$ (3)
[25]

QUESTION 2

2.1 Consider the arithmetic sequence: $15 ; 13 ; 11 ; 9 ; \dots ; -121$

2.1.1 Calculate the number of terms in the sequence. (3)

2.1.2 Hence, calculate the value of the following series:

$$7 + 15 + 7 + 13 + 7 + 11 + 7 + 9 + 7 \dots + 7 - 121 \quad (4)$$

2.2 Consider the following sequence of numbers illustrated by the columns and rows below.

2							Row 1
4	6						Row 2
8	10	12					Row 3
14	16	18	20				Row 4
22	24	26	28	30			Row 5
32	34	36	38	40	42		Row 6

2.2.1 The first term of Row n is given by $T_n = an^2 + bn + c$.

Determine the values of a , b and c . (3)

2.2.2 Hence, calculate the first term of Row 21. (2)

2.2.3 Calculate the 10th term of Row 21. (2)

[14]

QUESTION 3

3.1 Consider the geometric series: $729 + 243 + 81 + \dots$

3.1.1 Calculate T_9 .

(3)

3.1.2 It is given that:

$$729 + 243 + 81 + \dots + T_m = 1093\frac{1}{3}$$

Calculate m .

(3)

3.2 Consider the following infinite geometric series: $1 + r + r^2 + r^3 + \dots$

The second and each consecutive term that follows, is twice the sum of all the terms in the series following that term. Determine the value of the 2nd and 3rd terms of the series.

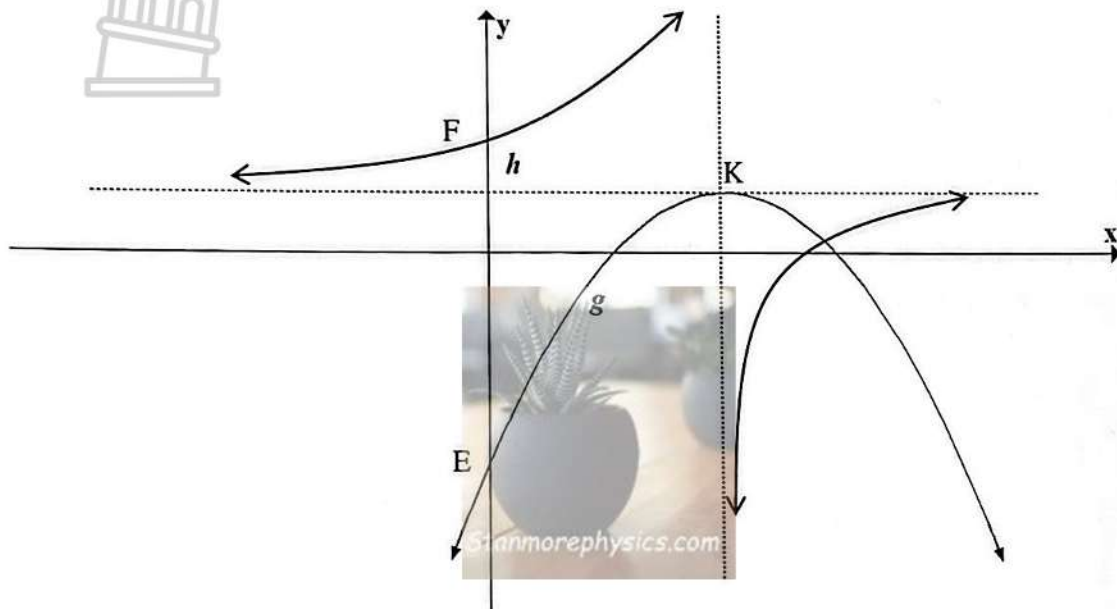
(5)

[11]

QUESTION 4

Sketched below are the graphs of $g(x) = ax^2 + bx - 7$ and $h(x) = -\frac{2}{x-3} + 2$.

E and F are the y-intercepts of g and h respectively. The turning point K is also the point of intersection of the two asymptotes of h .



- 4.1 Write down the coordinates of K. (2)
- 4.2 Calculate the length of EF. (4)
- 4.3 Determine the values of a and b in $g(x) = ax^2 + bx - 7$. (4)
- 4.4 Write down the range of $h(x) + 3$. (2)
- 4.5 For which values of p will $g(x) = p$ have TWO unequal positive roots? (2)
- 4.6 Determine the equation of the line of symmetry of h , $m < 0$, in the form $y = mx + c$. (3)
- 4.7 Describe the transformation from graph g to the graph of t , where $t(x) = (x - 3)^2$. (2)
- 4.8 It is given that $g(x) = f'(x)$.
Determine the x -value(s) where the gradient of a tangent to f is equal to 1. (3)
- [22]

QUESTION 5

Given the graph: $f(x) = \left(\frac{1}{3}\right)^x$

- 5.1 Determine the equation of g , which is the reflection of f about the line $y = x$, in the form $y = \dots$ (2)
- 5.2 Sketch the graphs of f and g on the same system of axes. Clearly show the intercepts with the axes. (4)
- 5.3 For which values of x is $g(x) > -1$? (3)
- 5.4 Describe the transformation of f to form graph h , where $h(x) = 27 \cdot \left(\frac{1}{3}\right)^x$. (2)
- [11]

QUESTION 6

- 6.1 Thabo deposits R3 550 into a savings account which pays interest at a rate of 8% p.a., compounded half-yearly.

Calculate the:

- 6.1.1 Effective interest rate he receives on his savings (3)
- 6.1.2 Final amount in his account after a period of 5 years (2)
- 6.2 A vehicle was bought for R185 000. Over a period of n years the value of the vehicle depreciated, according to a reducing-balance method, at a rate of 19% p.a., to a value of R48 896. Calculate n . (3)
- 6.3 Thembi was granted a loan of R35 000 at an interest rate of 18% p.a., compounded monthly. He agreed to repay the loan over 4 years.
- 6.3.1 Calculate the monthly instalment to repay the loan. (3)
- 6.3.2 Thembi was unable to pay the 21st and 22nd instalments. If he resumes payment at the end of the 23rd month, what will the outstanding balance be? (5)
- [16]

QUESTION 7

7.1 Given: $f(x) = -\frac{2}{x}$

Determine $f'(x)$ from first principles. (5)

7.2 Determine:

7.2.1 $D_x [3x^2 - 7x + 4]$ (2)

7.2.2 $\frac{dk}{dx}$, if $y = \frac{3}{x^3}$ and $k = y - \frac{1}{y}$ (4)

[11]

QUESTION 8

Given: $f(x) = x^3 - 2x^2 + x$

8.1 Determine the value(s) of x for which $f(x) = 0$ (3)

8.2 Calculate the coordinates of the turning points of f . (5)

8.3 Sketch the graph of f . Clearly show all turning points and intercepts with the axes. (3)

8.4 Determine for which values of x is:

8.4.1 $f'(x) < 0$ (2)

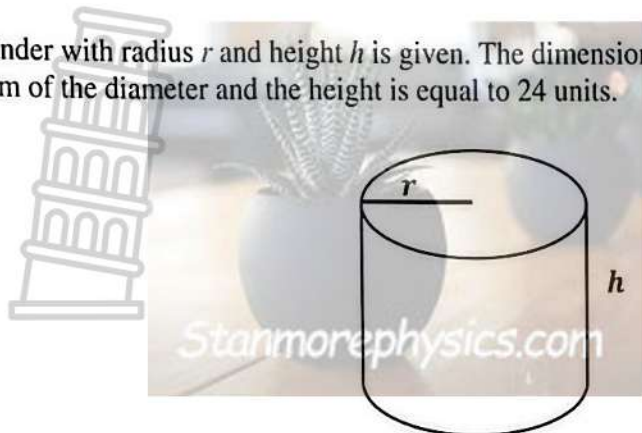
8.4.2 the graph of f concave down (4)

8.5 A tangent is drawn to the graph of g , where $g(x) = f(x-2)$. Calculate the gradient of the tangent at $x = 0$. (3)

[20]

QUESTION 9

A cylinder with radius r and height h is given. The dimensions of the cylinder are such that the sum of the diameter and the height is equal to 24 units.



Calculate the length of the radius such that the volume of the cylinder is a maximum.

[6]**QUESTION 10**

Sharon and Denice are retired teachers. Some days they forget to drink their medication. The probability that neither Sharon nor Denice will forget to take their medication, is 0,6.

10.1 Calculate the probability that at least one of them will forget to take their medication.

(1)

10.2 The probability that Sharon forgets to take medication at any randomly selected day is 0,24. The probability that both of them will forget to take their medication, is 0,14. Calculate the probability that Denice will forget to take medication on that day.

(3)

10.3 Determine whether the event of Sharon forgetting to take medication and the event of Denice forgetting to take medication are independent.

(3)**[7]****QUESTION 11**

The digits 0, 1, 2, 3, 4, 5 and 8 are used to make 3-digit codes.

11.1 Determine how many unique codes are possible if the:

11.1.1 digits can be repeated

(1)

11.1.2 digits cannot be repeated

(2)

11.2 In the case where digits may be repeated, what is the probability that the codes are numbers that are greater than 400 and exactly divisible by 5?

(4)**[7]****TOTAL: 150**

INFORMATION SHEET

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$y = mx + c$$

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

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

$$m = \tan \theta$$

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

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

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

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

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

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

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

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

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

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

$$\bar{x} = \frac{\sum_{i=1}^n x_i}{n}$$

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

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

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

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

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



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GRADE/GRAAD 12

MATHEMATICS/WISKUNDE

PAPER/VRAESTEL 1

SEPTEMBER 2025

MARKING GUIDELINES/NASIENRIGLYNE

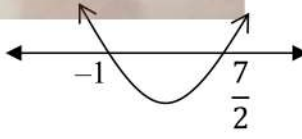
MARKS/PUNTE: 150

**These marking guidelines consist of 16 pages./
Hierdie nasienriglyne bestaan uit 16 bladsye.**

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

- 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 memorandum van toepassing.

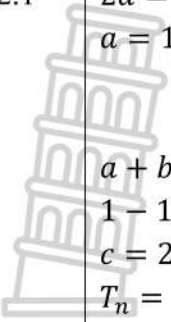
QUESTION 1/VRAAG 1

1.1.1	$x + x^2 = 0$ $x(1 + x) = 0$ $x = 0$ or $x = -1$	✓ factors/ faktore ✓ $x = 0$ or $x = -1$ (2)
1.1.2	$3x^2 - 5x + 1 = 0$ $x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(3)(1)}}{2(3)}$ $x = 1,43$ or $x = 0,23$	✓ substitution into correct formula/ subst. in korrekte formule ✓ $x = 1,43$ ✓ $x = 0,23$ (3)
1.1.3	$2x^2 - 7 \leq 5x$ $2x^2 - 5x - 7 \leq 0$ $(2x - 7)(x + 1) \leq 0$ $-1 \leq x \leq \frac{7}{2}$	 ✓ standard form/standaardvorm ✓ critical values/kritieke waardes ✓ $-1 \leq x$ and/en ✓ $x \leq \frac{7}{2}$ (4)
1.1.4	$3^{2x} - 9 = 24 \cdot 3^x + 72$ $(3^x + 3)(3^x - 3) = 24(3^x + 3)$ $(3^x + 3)(3^x - 27) = 0$ $3^x = 27 = 3^3$ or $3^x \neq -3$ $x = 3$ no solution/geen oplossing OR/OF $3^{2x} - 24 \cdot 3^x - 81 = 0$ $(3^x - 27)(3^x + 3) = 0$ $3^x = 27 = 3^3$ or $3^x \neq -3$ $x = 3$ no solution/geen oplossing	✓ factors/faktore ✓ factors/faktore ✓ both exponential equations/albei ekspo vergelykings ✓ $x = 3$ ✓ standard form/standaardvorm ✓ factors/faktore ✓ both exponential equations/albei ekspo vergelykings ✓ $x = 3$ (4)
1.1.5	$\sqrt{x^2 + 14} = 3\sqrt{x}$ $x^2 + 14 = 9x$ $x^2 - 9x + 14 = 0$ $(x - 7)(x - 2) = 0$ $x = 7$ or $x = 2$	✓ squaring both sides/kwadreer albei kante ✓ factors/faktore ✓ $x = 7$ ✓ $x = 2$ (4)

1.2	$y = 5x - 4$ $x^2 - x + (5x - 4)^2 = 4 - 3(5x - 4)$ $x^2 - x + 25x^2 - 40x + 16 = 4 - 15x + 12$ $26x^2 - 26x = 0$ $26x(x - 1) = 0$ $x = 0$ or $x = 1$ $y = -4$ or $y = 1$ OR/OF $x = \frac{y}{5} + \frac{4}{5}$ $x^2 - x + y^2 = 4 - 3y$ $\left(\frac{y}{5} + \frac{4}{5}\right)^2 - \left(\frac{y}{5} + \frac{4}{5}\right) + y^2 = 4 - 3y$ $\frac{y^2}{25} + \frac{8y}{25} + \frac{16}{25} - \frac{y}{5} - \frac{4}{5} + y^2 = 4 - 3y$ $y^2 + 8y + 16 - 5y - 20 + 5y^2 = 20 - 15y$ $6y^2 + 18y - 24 = 0$ $6(y + 4)(y - 1) = 0$ $y = -4$ or $y = 1$ $x = 0$ or $x = 1$	✓ y-subject/ <i>onderwerp</i> ✓ substitution/ <i>substitusie</i> ✓ simplification/ <i>vereenvoudiging</i> ✓ x-values/ <i>waardes</i> ✓ y-values/ <i>waardes</i> (5) OR/OF ✓ y-subject/ <i>onderwerp</i> ✓ substitution/ <i>substitusie</i> ✓ simplification/ <i>vereenvoudiging</i> ✓ y-values/ <i>waardes</i> ✓ x-values/ <i>waardes</i> (5)
1.3	$4^{24} + 8^{16} + 16^{12} + 64^8 = 2^k$ $(2^2)^{24} + (2^3)^{16} + (2^4)^{12} + (2^6)^8 = 2^k$ $2^{48} + 2^{48} + 2^{48} + 2^{48} = 2^k$ $2^{48}(1 + 1 + 1 + 1) = 2^k$ $2^{48}(4) = 2^k$ $2^{48} \cdot 2^2 = 2^k$ $2^{50} = 2^k$ $\therefore 50 = k$ Using calculator: Award only 1 mark $k = 50$/ <i>Gebruik van sakrekenaar: Slegs 1 punt vir $k=50$.</i>	✓ write all terms as base 2/ <i>herskryf met grondgetal van 2</i> ✓ $4 \cdot 2^{48}$ ✓ value of k / <i>waarde van k</i> (3)
		[25]

QUESTION 2/VRAAG 2

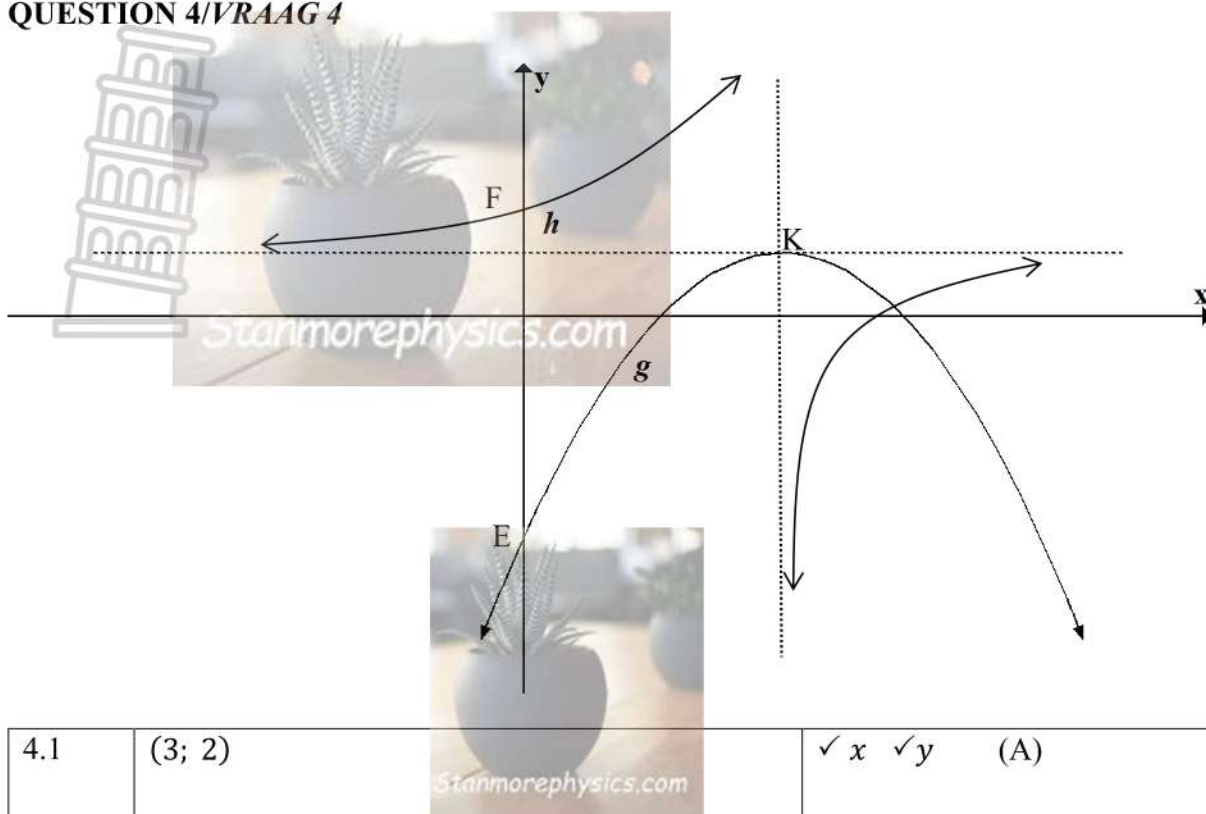
2.1.1	$T_n = a + (n - 1)d$ $-121 = 15 + (n - 1) - 2$ $-121 = -15 - 2n + 2$ $-138 = -2n$ $69 = n \text{ terms}$ OR/OF $T_n = -2n + 17$ $-121 = -2n + 17$ $2n = 138$ $n = 69 \text{ terms}$	✓ substitution of a and d into correct formula/<i>vervang a en d in korrekte formule</i> ✓ equating to/<i>gelykstel aan</i> -121 ✓ n (3) OR/OF ✓ substitution of/<i>subst. van</i> 17 and/<i>en</i> d into correct formula/<i>in korreke formule</i> ✓ equating to -121/<i>gelykstelling aan</i> -121 ✓ n (3)
2.1.2	$S_n = \frac{n}{2} [2a + (n - 1)d]$ $S_{69} = \frac{69}{2} [2(15) + 68(-2)]$ $= -3657$ $S_{\text{series}} = -3657 + 69(7)$ $= -3174$ OR/OF $S_n = \frac{n}{2} [a + l]$ $S_{69} = \frac{69}{2} [15 + (-121)]$ $= -3657$ $S_{\text{series}} = -3657 + 69(7)$ $= -3174$	✓ subst into correct formula/<i>subst. in korrekte formule</i> ✓ S_{69} ✓ $69(7)$ ✓ answer/<i>antwoord</i> OR/OF ✓ subst into correct formula/<i>subst. in korrekte formule</i> ✓ S_{69} ✓ $69(7)$ ✓ answer/<i>antwoord</i> (4)

2.2.1	$2a = 2$ $a = 1$ $3a + b = 2$ $3(1) + b = 2$ $b = -1$ $a + b + c = 2$ $1 - 1 + c = 2$ $c = 2$ $T_n = n^2 - n + 2$ OR/OF $a = \frac{1}{2}(2)$ $a = 1$ $c = T_1 + d_2 - d_1$ $= 2 + 2 - 2$ $c = 2$ $T_n = n^2 + bn + 2$ $2 = 1 + b + 2$ $b = -1$ $T_n = n^2 - n + 2$	 	✓ a ✓ b ✓ c OR/OF ✓ a ✓ c ✓ b	(3) (3)
2.2.2	$T_n = (21)^2 - 1(21) + 2$ $= 422$	Answer only: full marks/Slegs antwoord: volpunte	✓ substitution/substitusie ✓ answer/antwoord	(2)
2.2.3	$T_n = a + (n-1)d$ $T_{10} = 422 + 9(2)$ $= 440$ OR/OF $T_n = 2n + 420$ $T_{10} = 2(10) + 420$ $= 440$	Answer only: full marks/Slegs antwoord: volpunte	✓ subst into correct formula/subst. in korrekte formule ✓ answer/antwoord OR/OF ✓ subst into correct formula/subst. in korrekte formule ✓ answer/antwoord	(2) (2)
				[14]

QUESTION 3/VRAAG 3

3.1.1	$r = \frac{243}{729} = \frac{1}{3}$ $T_9 = 729 \left(\frac{1}{3}\right)^{9-1}$ $= \frac{1}{9}$	✓ value of/waarde van r ✓ subst into correct formula/subst. in korrekte formule ✓ answer/antwoord (3)
3.1.2	$S_n = \frac{a(1-r^n)}{1-r}$ $1093\frac{1}{3} = \frac{729\left(1-\left(\frac{1}{3}\right)^m\right)}{1-\frac{1}{3}}$ $\left(\frac{1}{3}\right)^m = \frac{1}{6561}$ $= \left(\frac{1}{3}\right)^8 \text{ or } m = \log_{\frac{1}{3}}\left(\frac{1}{6561}\right)$ $m = 8$	✓ subst into correct formula/subst. in korrekte formule ✓ simplification/vereenvoudiging ✓ value of/waarde van m (3)
3.2	$1 + r + r^2 + r^3 \dots$ $T_2 = 2(r^2 + r^3 + r^4 + \dots)$ $= 2\left(\frac{r^2}{1-r}\right)$ $\frac{2r^2}{1-r} = r$ $2r^2 = r - r^2$ $3r^2 - r = 0$ $r(3r - 1) = 0$ $r \neq 0 \text{ or } r = \frac{1}{3}$ $1 + \frac{1}{3} + \frac{1}{9} + \dots$ If T_2 is not in terms of r break down/Indien T_2 nie in terme van r afgebreek nie 0 MARKS/PUNTE	✓ T_2 in terms of/ in terme van r $/T_2 = 2S_\infty$ ✓ equating/gelykstelling ✓ factors/faktore ✓ r ✓ 2 nd and 3 rd terms/2 ^{de} en 3 ^{de} terme (5)
		[11]

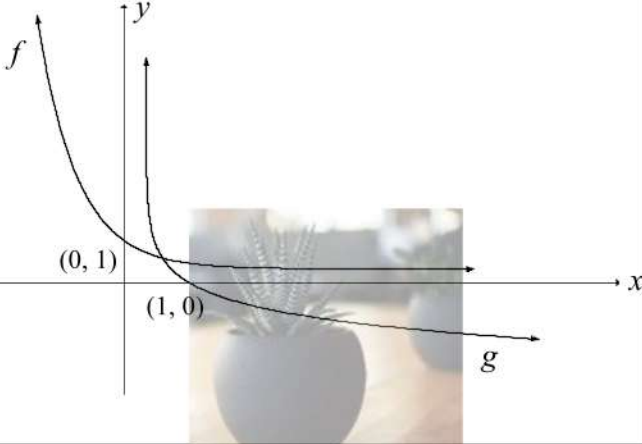
QUESTION 4/VRAAG 4



4.1	(3; 2)	✓ x ✓ y (A) (2)
4.2	$y = -\frac{2}{0-3} + 2$ $y = \frac{8}{3}$ $E(0; -7)$ $FE = \frac{8}{3} - (-7)$ $= \frac{29}{3}$ or $9\frac{2}{3}$	✓ $x = 0$ ✓ y -coordinate of/ y -koördinaat F ✓ y -coordinate of/ y -koördinaat E ✓ answer/ <i>antwoord</i> (4)
4.3	$y = a(x - 3)^2 + 2$ $-7 = a(0 - 3)^2 + 2$ $-9 = 9a$ $a = -1$ $y = -(x - 3)^2 + 2$ $y = -x^2 + 6x - 9 + 2$ $y = -x^2 + 6x - 7$	✓ subst (3; 2) ✓ subst (0; -7) (A) ✓ value of/ <i>waarde van a</i> ✓ $b = 6$ (4)
4.4	$y \in R; y \neq 5$ OR/OF $y \in (-\infty; \infty) - \{5\}$	✓ value of/ <i>waarde van 5</i> ✓ range/ <i>waardeversameling</i> $y \in R, y \neq 5$ (2) OR/OF ✓ value of/ <i>waarde van 5</i> ✓ range/ <i>waardeversameling</i> $/y \in R, y \neq 5$ (2)

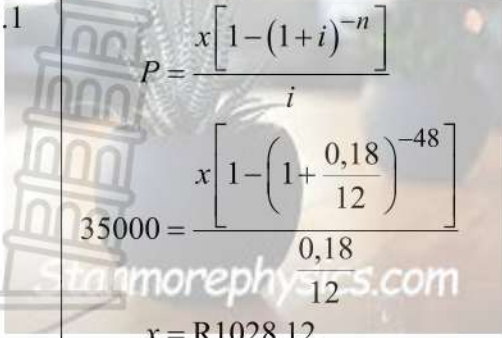
4.5	$-7 < p < 2$ OR/ OF $p \in (-7; 2)$	✓ critical values/ <i>kritiese waardes</i> ✓ correct interval/ <i>korrekte interval</i> (2) OR / OF ✓ critical values/ <i>kritiese waardes</i> ✓ correct interval/ <i>korrekte interval</i> (2)
4.6	$y = -x + c$ $2 = -3 + c$ $c = 5$ $y = -x + 5$ OR/OF $y - y_1 = -(x - x_1)$ $y - 2 = -(x - 3)$ $y = -x + 5$	✓ $m = -1$ ✓ subst K ✓ equation/ <i>vergelyking</i> (3) OR/OF ✓ $m = -1$ ✓ subst K ✓ equation/ <i>vergelyking</i> (3)
4.7	Reflection about the x -axis/across line $y = 0$ and then 2 units up/ <i>Refleksie in x-afsnit/lyn $y = 0$ en 2 eenhede opwaarts</i> OR/OF 2 units down and then a reflection about the x -axis/across line $y = 0$ / <i>2 eenhede afwaarts en dan refleksie oor x-afsnit/lyn $y = 0$</i>	✓ correct reflection/ <i>korrekte refleksie</i> ✓ 2 units up/ <i>eenhede opwaarts</i> (2) OR/OF ✓ 2 units down/ <i>2 eenhede af</i> ✓ correct reflection/ <i>korrekte refleksie</i> (2)
4.8	$1 = -x^2 + 6x - 7$ $0 = -x^2 + 6x - 8$ $0 = (x - 4)(x - 2)$ $x = 4$ or $x = 2$	✓ equating/ <i>gelykstelling</i> ✓ factors/ <i>faktore</i> ✓ values of x / <i>waardes van x</i> (3)
		[22]

QUESTION 5/VRAAG 5

5.1	$y = \left(\frac{1}{3}\right)^x$ $x = \left(\frac{1}{3}\right)^y$ $y = \log_{\frac{1}{3}} x$ OR/OR $y = \log_3 \frac{1}{x}$	✓ interchanging x and y / omruiling van x en y ✓ answer/antwoord (2)
5.2		f : ✓ intercept y -axis/ y -afsnit ✓ form /vorm g : ✓ intercept x -axis/ x -afsnit ✓ form/vorm (4)
5.3	$\log_{\frac{1}{3}} x = -1$ $x = 3$ $\therefore 0 < x < 3$ OR/OR $x \in (0 ; 3)$	✓ $x = 3$ ✓ critical values/kritiese waardes ✓ interval (3)
5.4	$h(x) = 27 \cdot \left(\frac{1}{3}\right)^x$ $= \left(\frac{1}{3}\right)^{x-3}$ $\therefore f$ shifts 3 units to the right/skuif 3 eenhede na regs OR/OR Enlargement or vertical stretch by a factor of 27/ Vergroting met skaalfaktor van 27	✓ h as a power of/ h as mag van $\frac{1}{3}$ ✓ answer/antwoord (2)
		[11]

QUESTION 6/VRAAG 6

6.1.1	$1 + i_{eff} = \left(1 + \frac{i}{m}\right)^m$ $1 + i_{eff} = \left(1 + \frac{0,08}{2}\right)^2$ $i_{eff} = \left(1 + \frac{0,08}{2}\right)^2 - 1$ $i_{eff} = 0,0816$ $i_{eff} = 8,16\%$	✓ subst into correct formula/subst. in korrekte formule ✓ i_{eff} ✓ answer/antwoord (3)
6.1.2	$A = P \left(1 + \frac{i^{(2)}}{2}\right)^{2n}$ $= 3550 \left(1 + \frac{0,08}{2}\right)^{10}$ $= R5254,87$ OR/OF $A = P(1 + i_{eff})^5$ $= 3550(1 + 0,0816)^5$ $= R5254,87$	✓ subst into correct formula/subst. in korrekte formule ✓ answer/antwoord (2) OR/OF ✓ subst into correct formula/subst. in korrekte formule ✓ answer/antwoord (2)
6.2	$A = P(1 - i)^n$ $48896 = 185000(1 - 0,19)^n$ $(0,81)^n = \frac{48896}{185000}$ $n = \log_{0,81} \left(\frac{48896}{185000}\right)$ $n = 6,31$	✓ subst into correct formula/subst. in korrekte formule ✓ using logs correctly/korrekte gebruik van log ✓ answer/antwoord (3)

6.3.1	 $P = \frac{x \left[1 - (1+i)^{-n} \right]}{i}$ $35000 = \frac{x \left[1 - \left(1 + \frac{0,18}{12} \right)^{-48} \right]}{\frac{0,18}{12}}$ $x = R1028,12$	✓ $n = 48$ ✓ subst into correct formula/ subst. in korrekte formule ✓ answer/antwoord (3)
6.3.2	$P_{balance(20th)} = \frac{1028,12 \left[1 - \left(1 + \frac{0,18}{12} \right)^{-28} \right]}{\frac{0,18}{12}}$ $x = R23365,79 \quad (\text{accept: } R23365,91)$ $Balance(23rd) = 23365,79 \left(1 + \frac{0,18}{12} \right)^2$ $= R24072,02 \quad (\text{accept: } R24072,14)$ OR/OF $F = \frac{x \left[(1+i)^n - 1 \right]}{i}$ $F = \frac{1028,12 \left[\left(1 + \frac{0,18}{12} \right)^{20} - 1 \right]}{\frac{0,18}{12}}$ $F = R23773,90$ $Balance(20th) = 35000 \left(1 + \frac{0,18}{12} \right)^{20} - 23773,90$ $= R23366,03$ $Balance(23rd) = 23366,03 \left(1 + \frac{0,18}{12} \right)^2$ $= R24072,26$	✓ $n = 28$ ✓ correct substitution in/korrekte subst. in P_v ✓ Balance after 20th/balans ná 20^{ste} ✓ adding interest/$A = P(1+i)^n$ byvoeging van rente ✓ answer/antwoord (5) OR/OF ✓ $n = 20$ ✓ correct substitution in A and F_v/ Korrekte substs in A en F ✓ Balance after 20th/Balans ná 20^{ste} ✓ adding interest/$A = P(1+i)^n$ byvoeging van rente ✓ answer/antwoord (5)
		[16]

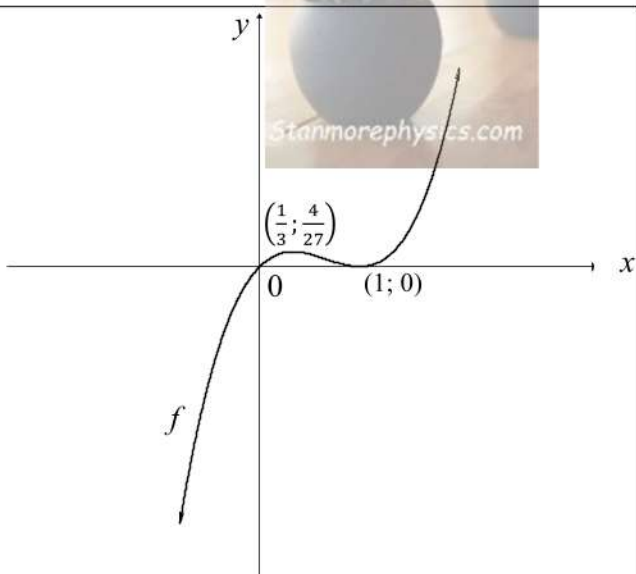
QUESTION 7/VRAAG 7

Max. of –1 for wrong notation in this question./ Maks. van –1 vir verkeerde notasie in hierdie vraag.		
7.1	$f(x) = -\frac{2}{x}$ $f(x+h) = -\frac{2}{x+h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{1}{h} \left[\frac{-2}{x+h} + \frac{2}{x} \right]$ $= \lim_{h \rightarrow 0} \frac{1}{h} \left[\frac{-2x + 2x + 2h}{x(x+h)} \right]$ $= \lim_{h \rightarrow 0} \frac{2}{x(x+h)}$ $= \frac{2}{x^2}$ OR/OF $f(x) = -\frac{2}{x}$ $f(x+h) = -\frac{2}{x+h}$ $\bar{m} = \frac{f(x+h) - f(x)}{h}$ $= \frac{1}{h} \left[\frac{-2}{x+h} + \frac{2}{x} \right]$ $= \frac{1}{h} \left[\frac{-2x + 2x + 2h}{x(x+h)} \right]$ $= \frac{2}{x(x+h)}$ $f'(x) = \lim_{h \rightarrow 0} \frac{2}{x(x+h)}$ $= \frac{2}{x^2}$	✓ $f(x+h)$ ✓ subst in correct formula/subst. in korrekte formule ✓ $f(x+h) - f(x)$ ✓ simplification/vereenvoudiging ✓ answer/antwoord (5) OR/OF ✓ $f(x+h)$ ✓ $f(x+h) - f(x)$ ✓ simplification/vereenvoudiging ✓ subst in correct formula/subst. in korrekte formule ✓ answer/antwoord (5)

7.2.1	$D_x[3x^2 - 7x + 4]$ $= 6x - 7$	$\checkmark 6x \quad \checkmark -7$ (2)
7.2.2	$k = \frac{3}{x^3} - \frac{x^3}{3}$ $k = 3x^{-3} - \frac{1}{3}x^3$ $\frac{dk}{dx} = -9x^{-4} - x^2$	$\checkmark k \text{ in terms of/in terme van } x$ $\checkmark 3x^{-3}$ $\checkmark -9x^{-4} \quad \checkmark -x^2$ (4)
		[11]



QUESTION 8/VRAAG 8

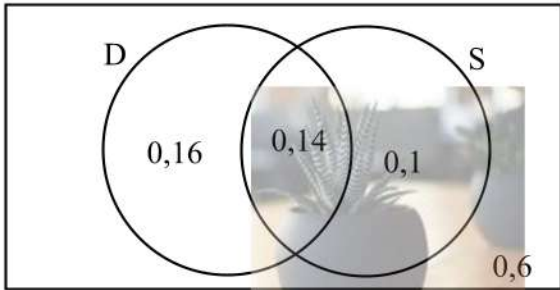
8.1	$0 = x^3 - 2x^2 + x$ $0 = x(x-1)(x-1)$ $x = 0 \text{ or } x = 1$	Answers only: full marks/Slegs antwoorde: volpunte	✓ factors/faktpre ✓ $x = 0$ ✓ $x = 1$	(3)
8.2	$y = x^3 - 2x^2 + x$ $\frac{dy}{dx} = 3x^2 - 4x + 1$ $0 = (3x-1)(x-1)$ $x = 1 \text{ or } x = \frac{1}{3}$ $f\left(\frac{1}{3}\right) = \left(\frac{1}{3}\right)^3 - 2\left(\frac{1}{3}\right)^2 + \frac{1}{3} = \frac{4}{27}$ $(1; 0) \text{ or } \left(\frac{1}{3}; \frac{4}{27}\right)$		✓ $f'(x)$ ✓ $f'(x) = 0$ ✓ x-values/x-waardes ✓ Turning point/draaipunt $(1; 0)$ ✓ Turning point/draaipunt $\left(\frac{1}{3}; \frac{4}{27}\right)$	(5)
8.3			✓ turning points/draaipunte ✓ origin/y-intercept/ oorsprong/y-afsnit ✓ shape/vorm	(3)
8.4.1	$\frac{1}{3} < x < 1 \text{ OR } x \in \left(\frac{1}{3}; 1\right)$		✓ critical values/kritiese waardes ✓ interval/interval	(2)
8.4.2	$f''(x) = 6x - 4 = 0$ $x = \frac{2}{3}$ $\therefore x < \frac{2}{3}$ OR/OF $x_{\text{inflexion}} = \frac{1 + \frac{1}{3}}{2} = \frac{2}{3}$ $x \in \left(-\infty; \frac{2}{3}\right)$		✓ $f''(x) = 0$ ✓ $x = \frac{2}{3}$ ✓✓ answer/antwoord OR/ OF ✓ method/metode ✓ $x = \frac{2}{3}$ ✓✓ answer/antwoord	(4)

8.5	 $f(x-2) = (x-2)(x-2-1)^2$ $= x^3 - 8x^2 + 21x - 18$ $\frac{d}{dx} = 3x^2 - 16x + 21$ $= 3(0)^2 - 16(0) + 21$ $= 21$ OR/OF $f'(-2) = 3(-2)^2 - 4(-2) + 1$ $= 21$	$\checkmark x^3 - 8x^2 + 21x - 18$ $\checkmark \frac{d}{dx}$ $\checkmark \text{ answer/antwoord}$ (3) OR/OF $\checkmark x = -2$ $\checkmark \text{ subst into derivative/subst. in afgeleide}$ $\checkmark \text{ answer/antwoord}$ (3)
		[20]

QUESTION 9/VRAAG 9

	 $2r + h = 24$ $h = 24 - 2r$ $V = \pi r^2 h$ $= \pi r^2 (24 - 2r)$ $= 24\pi r^2 - 2\pi r^3$ $V'(r) = 48\pi r - 6\pi r^2$ $0 = 6\pi r(8 - r)$ $r = 8 \text{ units}$	$\checkmark 2r + h = 24$ $\checkmark \text{ subst } h \text{ into } V \text{ formula/subst. } h \text{ in } V\text{-formule}$ $\checkmark \text{ simplification/vereenvoudiging}$ $\checkmark V'(r) = 0$ $\checkmark \text{ common factor/gemene faktor}$ $\checkmark \text{ answer/antwoord}$ (6)
		[6]

QUESTION 10/VRAAG 10

10.1	$P(\text{at least one}) = 1 - 0,6 = 0,4$	✓ answer/antwoord (1)
10.2	$P(S \text{ or } D) = P(S) + P(D) - P(S \text{ and } D)$ $0,4 = 0,24 + P(D) - 0,14$ $P(D) = 0,3$ OR/OF  $P(D) = 0,3$	✓✓ correct subst into correct formula/korrekte substs in korrekte formule ✓ answer/antwoord OR/OF ✓✓ subst into Venn diagram/subst. in Venn-diagram ✓ answer/antwoord (3)
10.3	$P(S) \times P(D)$ $= 0,24 \times 0,3$ $= 0,072$ $P(D \text{ and } S) = 0,14$ $P(D \text{ and } S) \neq P(D) \times P(S)$ $\therefore$ not independent/is nie onafhanklik nie	✓ $P(S) \times P(D)$ ✓ 0,072 ✓ conclusion/slotsom (3)
		[7]

QUESTION 11/VRAAG 11

11.1	$7^3 = 343$	✓ 7^3 (1)
11.2	$7 \times 6 \times 5$ OR $\frac{7!}{4!}$ OR 210	✓✓ answer/antwoord (2)
11.2	$3 \times 7 \times 2 - 1 = 41$ (400 must be excluded/iutgesluit) $P = \frac{41}{343} = 0,12$ Maximum 3 marks if 400 is included/ Maksimum 3 punte as 400 ingesluit is	✓✓ $3 \times 7 \times 2$ ✓ -1 ✓ answer/antwoord (4)
		[7]

TOTAL/TOTAAL: 150