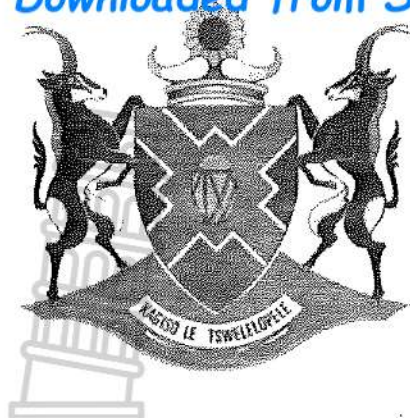




education

Department:
Education
North West Provincial Government
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

MATHEMATICS P1
SEPTEMBER 2026 cs.com

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MARKS: 150

TIME: 3 hours

This question paper consists of 10 pages and 1 information sheet.

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. Number the answers correctly according to the numbering system used in this question paper.
4. Clearly show ALL calculations, diagrams, graphs, etc. that you have used in determining your answers.
5. Answers only will NOT necessarily be awarded full marks.
6. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
7. If necessary, round off answers to TWO decimal places, unless stated otherwise.
8. Diagrams are NOT necessarily drawn to scale.
9. An information sheet with formulae is included at the end of the question paper.
10. Write neatly and legibly.

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QUESTION 11.1 Solve for x :

1.1.1 $(3 - x)(2x + 8) = 0$ (2)

1.1.2 $3x^2 - 7x - 2 = 0$ (correct to TWO decimal places) (3)

1.1.3 $x^2 - x - 6 \geq 0$ (4)

1.1.4 $12^{2x} = 8(36^x)$ (5)

1.1.5 $6\sqrt{x-5} + x = 5$ (5)

1.2 Solve for x and y simultaneously:

$x + y = -2$ and $x^2 - 4x + y^2 + 8y + 2 = 0$ (5)

1.3 Determine two numerical values of k for which $x^2 + k(2x - 4) + 5$ is a perfect square.(4)
[28]**QUESTION 2**2.1 Given: $\sum_{k=4}^p (2k - 5)$

2.1.1 Write down the first THREE terms of the series. (1)

2.1.2 Determine the general term of the series. (2)

2.1.3 Calculate T_{50} of this series. (1)2.1.4 For which values of p will $\sum_{k=4}^p (2k - 5) < 5\,000$? (6)2.2 A number k must be added to each term of the sequence $-1; 2; 8$ such that the sequence that is formed, will be a geometric sequence.2.2.1 Determine the value of k . (3)2.2.2 Calculate the sequence if $k = 4$. (1)

2.2.3 Give a reason why this is NOT a converging sequence. (1)

2.2.4 Calculate the sum of the first 15 terms. (2)
[17]

QUESTION 3

A quadratic sequence, $T_n = an^2 + bn + c$, has the following properties:

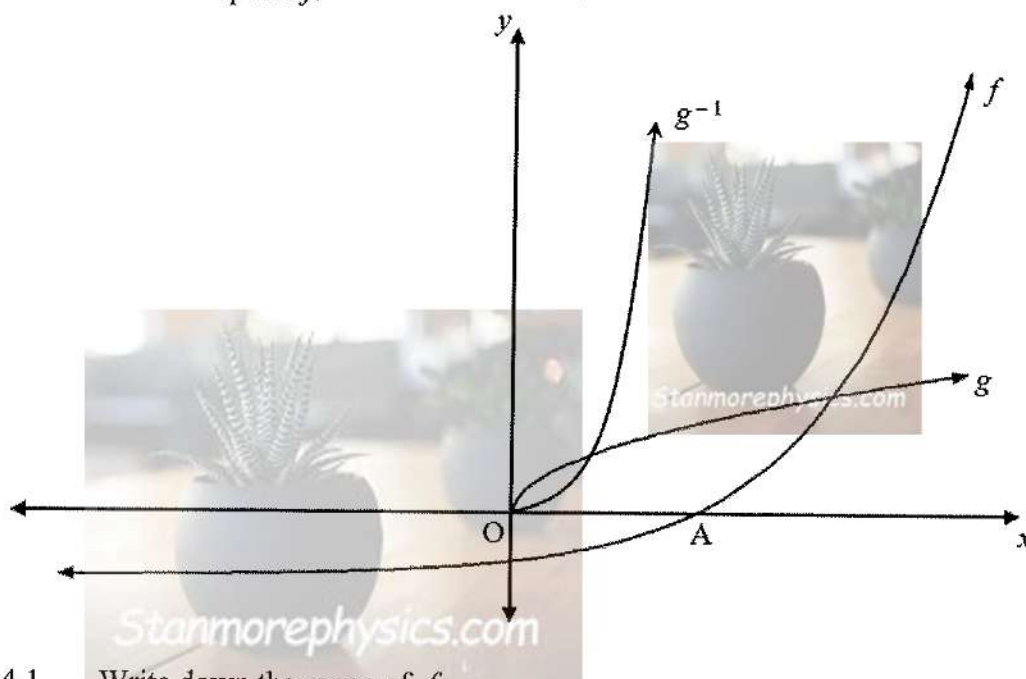
- $T_3 = T_7$
- The smallest term of the quadratic sequence is 10.
- The first term of the sequence of first differences is -14 .

Determine the general term of this quadratic sequence.

[6]

QUESTION 4

The graphs of $g(x) = 2\sqrt{x}$ for $x \geq 0$, g^{-1} and $f(x) = 2^{x-1} - 2$ are drawn below. A is the x -intercept of f .



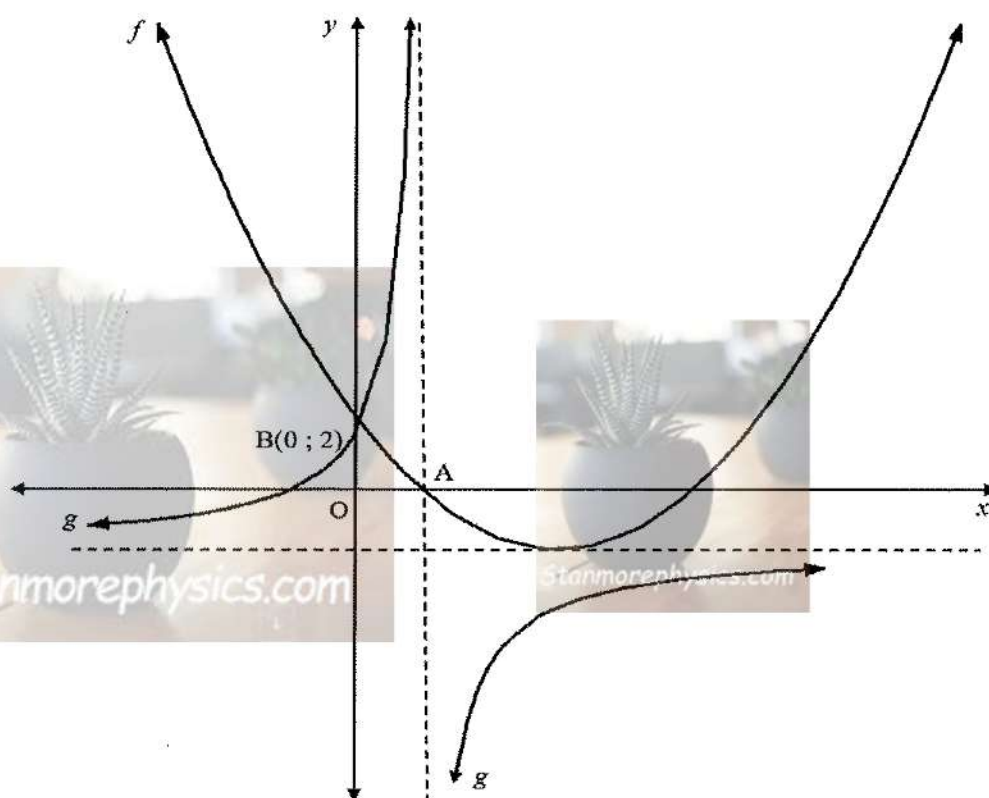
- 4.1 Write down the range of f . (1)
- 4.2 Calculate the coordinates of A. (2)
- 4.3 Determine the equation of g^{-1} in the form $y = \dots$ (2)
- 4.4 Determine the value of x , for which the distance between g and g^{-1} will be a maximum. (4)
- 4.5 Determine the values of k where $[g(x)^{-1} + k] - g(x)$ will be positive for $x \geq 0$. (2)
- 4.6 It is further given that $h(x) = \left(\frac{1}{2}\right)^x$. Describe the transformation from f to h . (3)

[14]

QUESTION 5

In the diagram below, the graphs of $f(x) = \frac{1}{2}(x - 3)^2 - 2$ and $g(x) = \frac{a}{x + p} + q$ are drawn.

- The horizontal asymptote of g is a tangent to f .
- A is a x -intercept of f and lies on the vertical asymptote of g .
- B(0 ; 2) is the y -intercept of g .



- 5.1 Write down the coordinates of the turning point of f . (1)
- 5.2 Calculate the coordinates of A. (3)
- 5.3 Write down the range of g . (1)
- 5.4 Determine the equation of g . (3)
- 5.5 Determine the equation of k , the decreasing axis of symmetry of g . (3)
- 5.6 Determine the values of x for which: $g(x) \cdot f'(x) \geq 0$. (3)
- 5.7 For which values of t will: $f(x) = k(x) + t$ have two distinct roots greater than 1? (7)

[21]

QUESTION 6

Sam plans to buy a house with the value of R1 200 000. He borrows R1 200 000 from a financial institution that charges interest at a rate of 9,8% per annum compounded monthly. Sam agrees to pay monthly instalments of R15 000, starting 4 months after the loan was granted.

- 6.1 Calculate the amount Sam owes to the financial institution at the beginning of the 4th month. (3)
- 6.2 Determine how many monthly instalments will Sam pay to settle the loan. (4)
- 6.3 Eighty months after Sam bought the house, he received an offer of R2 000 000 for the house. He decided to sell the house. Calculate the profit Sam made on the sale of the house. (6)
- [13]**

QUESTION 7

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

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

7.2 Determine:

7.2.1 $D_x[(x-3)(x-1)]$ (3)

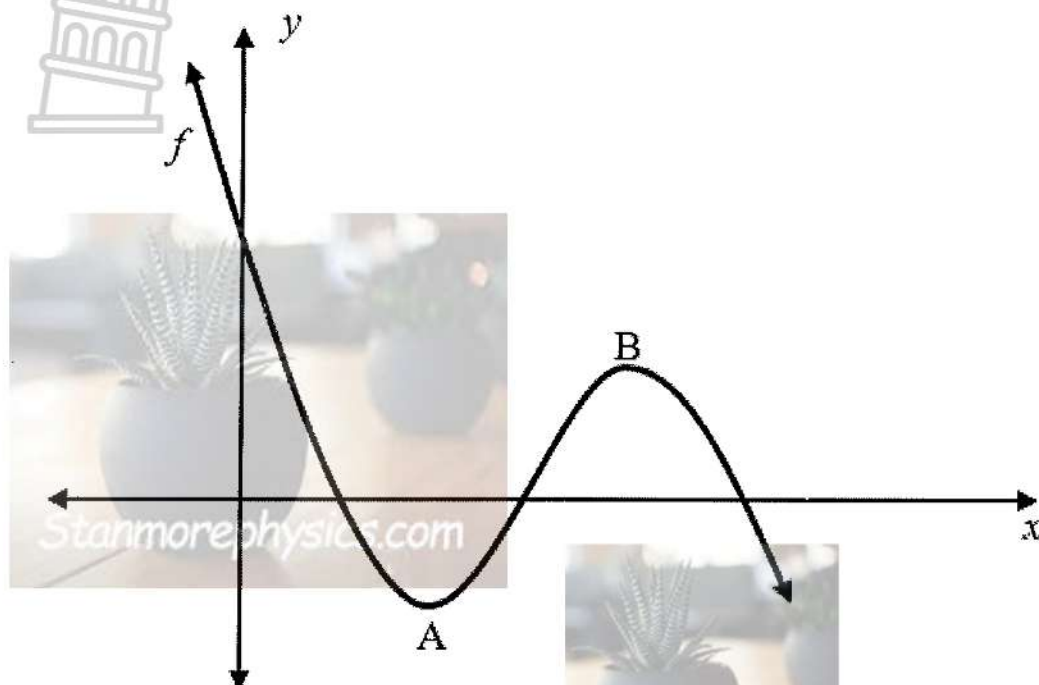
7.2.2 $f'(x)$ if $f(x) = 2\sqrt[3]{x^4} + \frac{3}{x^5}$ (4)

7.3 Use the following information below to draw a neat sketch graph of $f(x) = ax^3 + bx^2 + cx + d$ (without calculating the values of a, b, c or d).

- $f'(-1) = 0$
 - $f''(-1) < 0$
 - $y = 2$ is a tangent to $f(x)$ at $x = 3$
- (4)
[16]

QUESTION 8

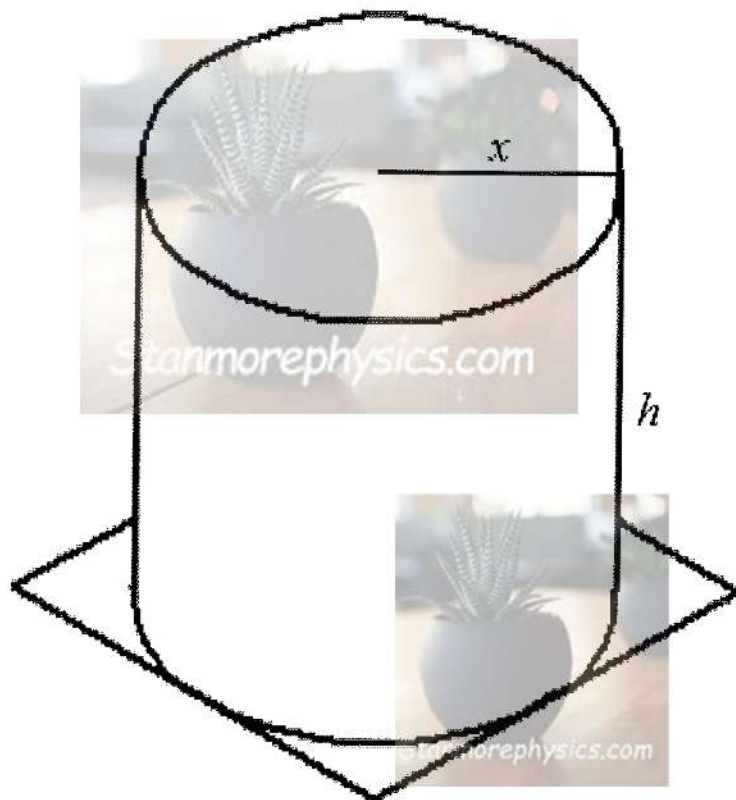
The graph of $f(x) = -2x^3 + 21x^2 - 60x + 43$ is sketched below. A and B are the turning points of f .



- 8.1 Determine the x -values of A and B. (3)
- 8.2 Determine the equation of the tangent to f with a maximum gradient. Give your answer in the form $y = mx + c$. (5)
- 8.3 Determine how many different positive real roots will $f(x + 2) - 20$ have, WITHOUT solving for x . (3)
- [11]

QUESTION 9

A farmer wants to make a metal container by attaching a pipe to a square base. The radius of the pipe is x and the height h . The length of the square is $2x$.

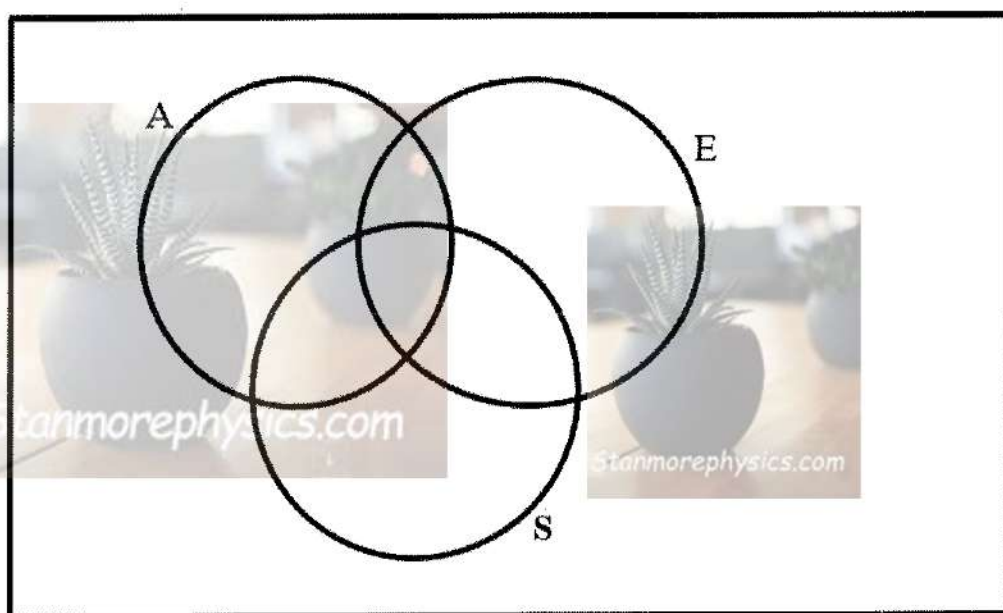


- 9.1 Show that the area of the container is given by $A = 4x^2 + 2\pi xh$. (1)
- 9.2 If the farmer only has 20 m^2 metal sheet, determine the height of the container in terms of x and π . (3)
- 9.3 Show that the volume of the container is given by: $V(x) = 10x - 2x^3$. (1)
- 9.4 Calculate the maximum volume of the container. (4)
- [9]**

QUESTION 10

A survey was conducted among 200 grade 12 learners of a high school to determine which languages the learners use at their homes. The results are shown below:

- 70 speak Afrikaans
- 73 speak Setswana
- 63 speak only English
- 8 speak all three languages
- 11 speak Afrikaans and Setswana
- 18 speak English and Setswana
- 18 speak Afrikaans and English but not Setswana
- 5 speak none of the three languages at home



- 10.1 Complete the Venn-diagram to represent the given data, in your answer book. (3)
- 10.2 Calculate the probability that a learner, chosen at random, will speak only ONE of these three languages at home. (2)
- 10.3 Determine whether the events to speak Afrikaans at home and to speak Setswana at home, are independent. (4)
- [9]

QUESTION 11

Lucea is a grade 12 head at a high school and received the task to set the winter school timetable. There are 8 subjects that she must place in 8 days, one subject per day and no subject may be repeated.

The subjects that must fit in the timetable are:

Mathematics, Physical Sciences, Computer Application Technology, Information Technology, Engineering Graphics and Design, Accounting, Business Studies and Economics.

- 11.1 Calculate how many different ways can Lucea place the 8 subjects in 8 days. (1)
- 11.2 Ben has the following subjects: Mathematics, Physical Sciences, Accounting and Economics. Calculate the probability that his subjects will be next to each other on the timetable. (2)
- 11.3 The learners request that the winter school timetable must start and end with a commercial subject (Accounting, Business Studies or Economics) and that Mathematics and Physical Sciences must not be next to each other. On how many different ways can Lucea set the timetable to comply with the requests of the learners? (3)

[6]**TOTAL: 150**

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INFORMATION SHEET: MATHEMATICS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$y = mx + c$$

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

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

$$m = \tan \theta$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

LEARNER'S NAME/NAAM VAN LEERDER

**NATIONAL SENIOR CERTIFICATE/
NASIONALE SENIOR SERTIFIKAAT**

MATHEMATICS P1/WISKUNDE V1

GRADE 12/GRAAD 12

SEPTEMBER 2026

**SPECIAL ANSWER BOOK/
SPESIALE ANTWOORDEBOEK**

QUESTION/ VRAAG	MARKS/ PUNTE	INITIALS/ PARAAF	MODERATOR
1			
2			
3			
4			
5			
6			
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8			
9			
10			
11			
TOTAL/ TOTAAL			

**This answer book consists of 18 pages.
Hierdie antwoordeboek bestaan uit 18 bladsye.**

FOLLOW THESE INSTRUCTIONS CAREFULLY	VOLG HIERDIE INSTRUKSIES NOUKEURIG
1. Clearly write your name in the space provided. 2. No pages may be torn OR ADDED from this answer book. 3. Read the instructions given in the examination paper carefully. 4. Learners may not retain any answer book or remove them from the examination room. 5. Answers must be written in black/blue ink as distinctly as possible. 6. Draw a neat line through any work/rough work that must not be marked.	1. Skryf jou naam in die ruimte soos verskaf. 2. Geen bladsy mag uit hierdie antwoordeboek geskeur word OF BYGEVOEG WORD nie. 3. Lees die instruksies wat in die eksamen vraestel gegee word, sorgvuldig deur. 4. Leerders mag geen antwoordeboek behou of uit die eksamenlokaal verwyder nie. 5. Skryf die antwoorde so duidelik moontlik met swart/blou ink. 6. Trek 'n netjiese lyn deur enige werk/rofwerk wat nie nagesien moet word nie.



QUESTION/VRAAG 1

	Solution/Oplossing	Marks /Punte
1.1.1		(2)
1.1.2		(3)
1.1.3		(4)
1.1.4		(5)

1.1.5		
		(5)
1.2		
		(5)
1.3		
		(4)
		[28]

QUESTION/VRAAG 2

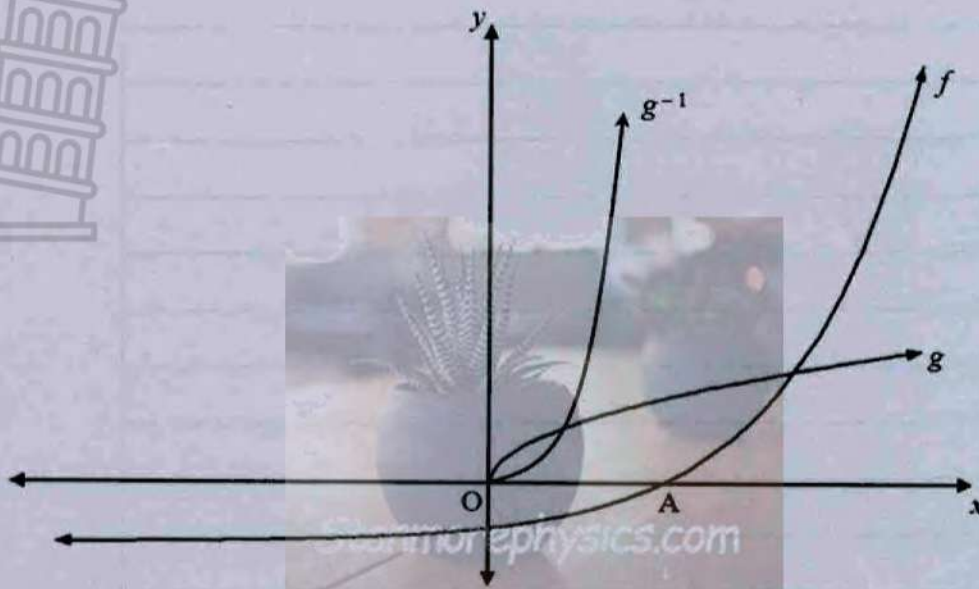
	Solution/Oplossing	Marks/ Punte
2.1.1		(1)
2.1.2		(2)
2.1.3		(1)
2.1.4		(6)

2.2.1		
		(3)
2.2.2		(1)
2.2.3		(1)
2.2.4		
		(2)
		[17]

QUESTION/VRAAG 3

	Solution/Oplossing	Marks/ Punte
		(6)
		[6]

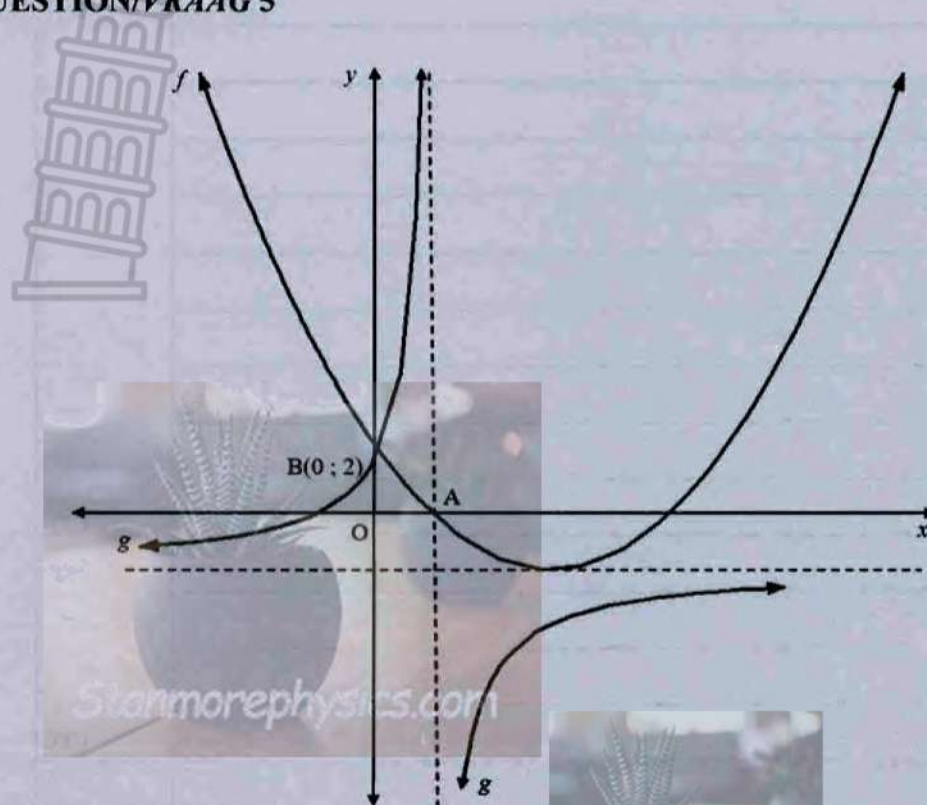
QUESTION/VRAAG 4



	Solution/Oplissing	Marks/ Punte
4.1		(1)
4.2		(2)
4.3		(2)

4.4		(4)
	4.5	
4.6		(3)
		[14]

QUESTION/VRAAG 5



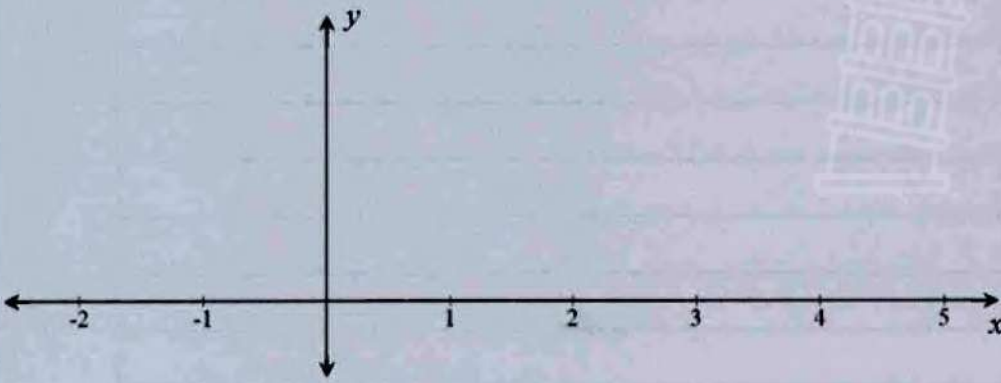
	Solution/Oplissing	Marks/ Punte
5.1		(1)
5.2		(3)
5.3		(1)

5.4		(3)
5.5		(3)
5.6		(3)
5.7		(7)

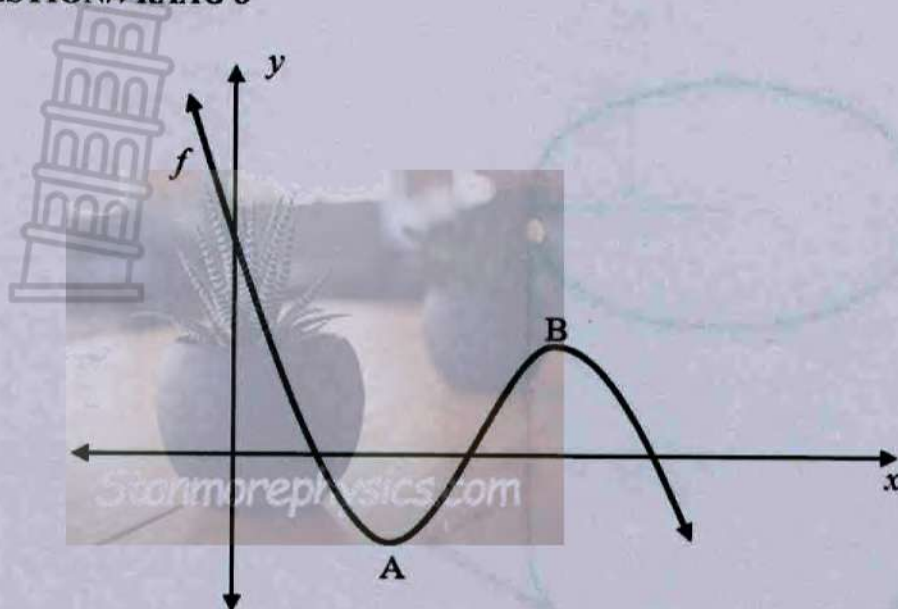
QUESTION/VRAAG 6

	Solution/Oplissing	Marks/ Punte
6.1		(3)
6.2		(4)
6.3		(6)
		[13]

QUESTION/VRAAG 7

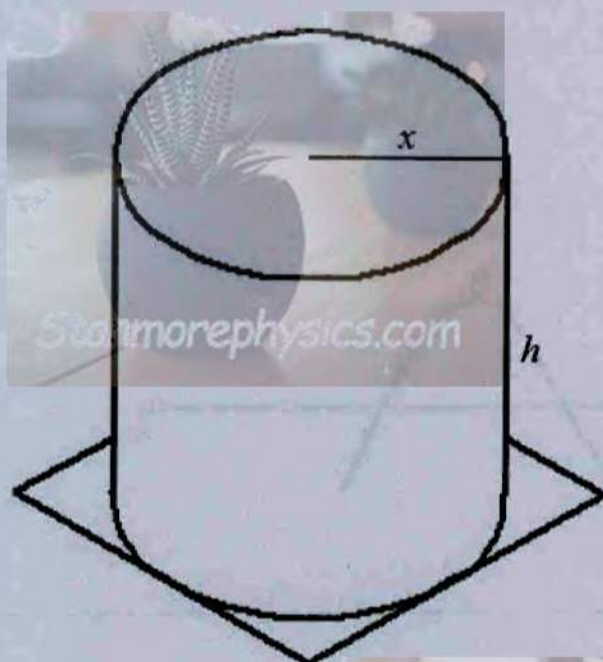
	Solution/Oplossing	Marks/ Punte
7.1		(5)
7.2.1		(3)
7.2.2		(4)
7.3		(4)
		[16]

QUESTION/VRAAG 8



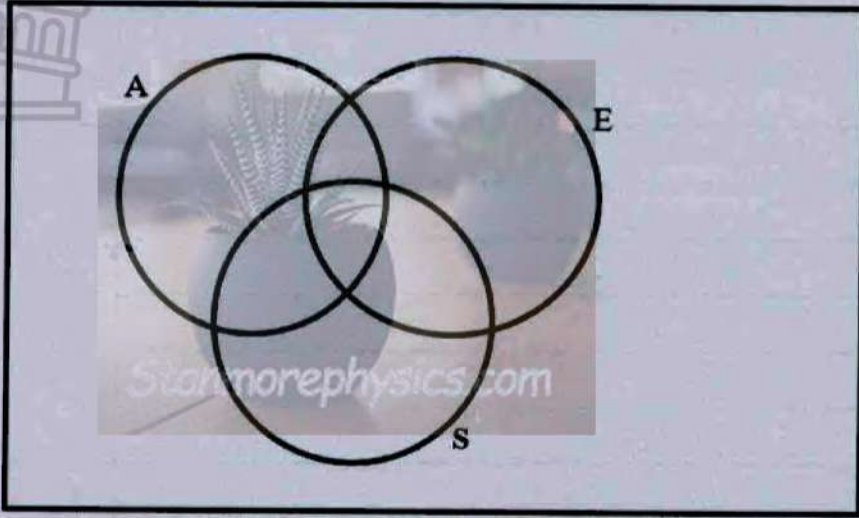
	Solution/Oplissing	Marks/ Punte
8.1		(3)
8.2		(5)
8.3		(3)
		[11]

QUESTION/VRAAG 9



	Solution/Oplossing	Marks/ Punte
9.1		(1)
9.2		(3)
9.3		(1)
9.4		(4)
		[9]

QUESTION/VRAAG 10

	Solution/Oplissing	Marks/ Punte
10.1		
10.2		(3)
10.3		(2)
		(4)
		[9]

QUESTION/VRAAG 11

	Solution/Oplossing	Marks/ Punte
11.1		(1)
11.2		(2)
11.3		(3)
		[6]

TOTAL/TOTAAL: 150

	Additional space/Addisionele spasie	Marks/ Punte

	Addition
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GRADE 12

MATHEMATICS P1

SEPTEMBER 2026

MARKING GUIDELINES

POINTS: 150

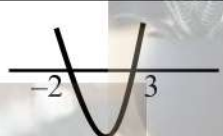
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These marking guidelines consist of 18 pages.

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
1.1.5	$6\sqrt{x-5} + x = 5$ $6\sqrt{x-5} = 5 - x$ $(6\sqrt{x-5})^2 = (5-x)^2$ $36(x-5) = 25 - 10x + x^2$ $36x - 180 = 25 - 10x + x^2$ $0 = x^2 - 46x + 205$ $0 = (x-41)(x-5)$ $x = 41 \text{ of } x = 5$ n.v.t 	✓ isoleer wortel ✓ kwadreer beide kante ✓ standaardvorm ✓ beide antwoorde ✓ seleksie
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

	$x + y = -2$ $x = -y - 2$ $(-y - 2)^2 - 4(-y - 2) + y^2 + 8y + 2 = 0$ $y^2 + 4y + 4 + 4y + 8 + y^2 + 8y + 2 = 0$ $2y^2 + 16y + 14 = 0$ $y^2 + 8y + 7 = 0$ $(y + 7)(y + 1) = 0$ $y = -7$ of $y = -1$ $x = -(-7) - 2$ $x = -(-1) - 2$ $= 5$ $= -1$	✓ 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: $-k^2 - 4k + 5 = 0$ $k^2 + 4k - 5 = 0$ $(k + 5)(k - 1) = 0$ $k = -5$ of $k = 1$ 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 $\therefore \Delta = 0$ $4k^2 + 16k - 20 = 0$ $k^2 + 4k - 5 = 0$ $(k + 5)(k - 1) = 0$ $k = -5$ of $k = 1$	✓ vereenvoudig ✓ voltooi vierkant ✓ $-k^2 - 4k + 5 = 0$ ✓ beide antwoorde (4) ✓ vereenvoudig ✓ substitusie ✓ $4k^2 + 16k - 20 = 0$ ✓ beide antwoorde (4)
		[28]

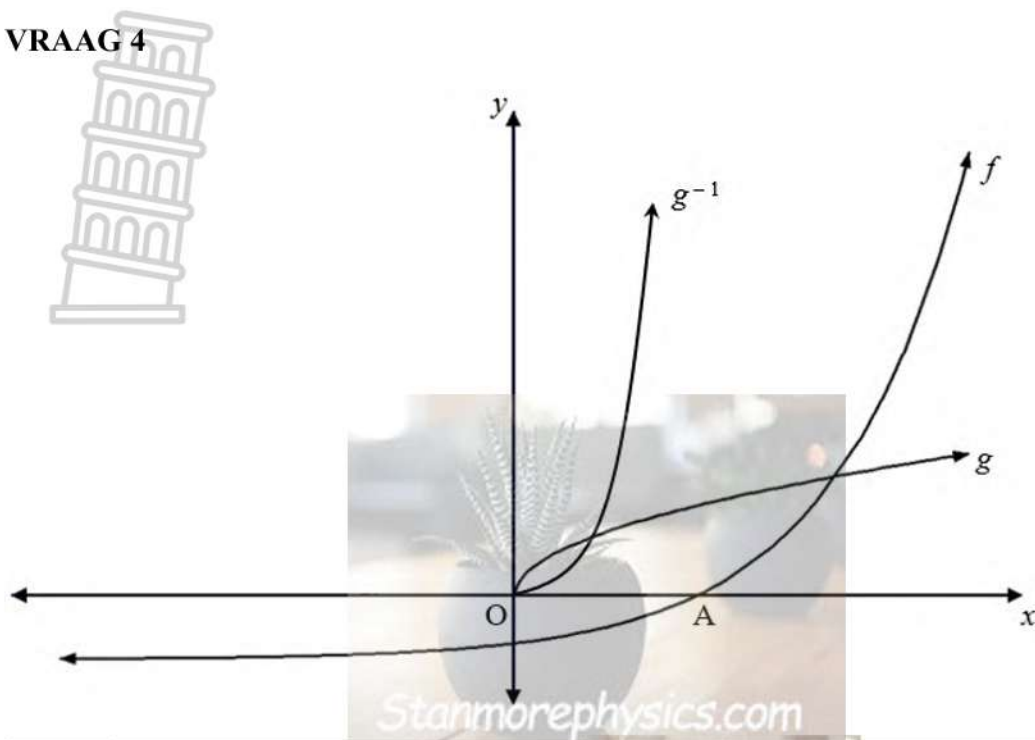
VRAAG 2

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]

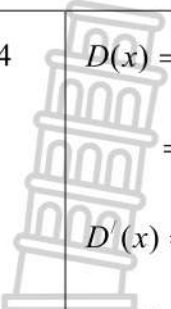
VRAAG 3

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

VRAAG 4

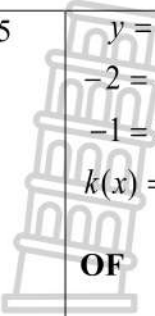


4.1	$y > -2$	✓ $y > -2$	(1)
4.2	$0 = 2^{x-1} - 2$ $2^1 = 2^{x-1}$ $x - 1 = 1$ $x = 2$ $\therefore A(2; 0)$	✓ $y = 0$ ✓ $x = 2$	(2)
4.3	$g: y = 2\sqrt{x}; x \geq 0 \ y \geq 0$ $g^{-1}: x = 2\sqrt{y}; y \geq 0 \ x \geq 0$ $\sqrt{y} = \frac{x}{2}$ $y = \frac{x^2}{4}; y \geq 0 \ x \geq 0$	✓ ruil x en y om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

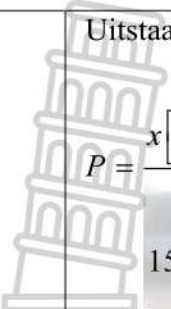
5.1	$(3; -2)$	✓ $(3; -2)$ (1)
5.2	$0 = \frac{1}{2}(x - 3)^2 - 2$ $2 = \frac{1}{2}(x - 3)^2$ $4 = (x - 3)^2$ $\pm 2 = x - 3$ $x = 5 \text{ of } x = 1$ $n.v.t \quad \therefore A(1;0)$ OF $0 = \frac{1}{2}(x - 3)^2 - 2$ $0 = \frac{1}{2}(x^2 - 6x + 9) - 2$ $0 = \frac{1}{2}x^2 - 3x + \frac{5}{2}$ $0 = x^2 - 6x + 5$ $0 = (x - 5)(x - 1)$ $x = 5 \text{ of } x = 1$ $n.v.t \quad \therefore A(1;0)$	✓ $y = 0$ ✓ 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 $y = -(x + p) + q$ $= -(x - 1) - 2$ $= -x + 1 - 2$ $k(x) = -x - 1$	$\checkmark m = -1$ $\checkmark$ substitusie (1 ; -2) $\checkmark$ antwoord (3) $\checkmark m = -1$ $\checkmark$ substitusie (1 ; -2) $\checkmark$ antwoord (3)
5.6	$x \in (-\infty ; -1] \cup (1 ; 3]$ OF $x \leq -1 \text{ of } 1 < x \leq 3$	$\checkmark (-\infty ; -1] \checkmark \checkmark (1 ; 3]$ (3) $\checkmark x \leq -1 \checkmark \checkmark 1 < x \leq 3$ (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	$\checkmark$ vereenvoudig $\checkmark f'(x) = -1$ $\checkmark x = 2$ $\checkmark f(2) = -1,5$ $\checkmark k(2) = -3$ $\checkmark$ afstand $\checkmark$ 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]

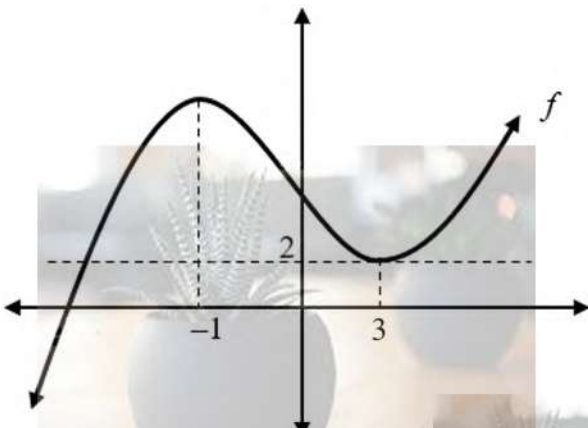
VRAAG 6

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	$P = \frac{x \left[1 - (1 + i)^{-n}\right]}{i}$ $1\,229\,640,75 = \frac{15\,000 \left[1 - \left(1 + \frac{0,098}{12}\right)^{-n}\right]}{0,098}$ $0,6694710772 = 1 - \left(1 + \frac{0,098}{12}\right)^{-n}$ $\left(1 + \frac{0,098}{12}\right)^{-n} = 0,3305289228$ $-n = \log_{\left(1 + \frac{0,098}{12}\right)} 0,3305289228$ $-n = -136,1112836$ ∴ 137 maandelikse paaieimente	✓ substitusie ✓ vereenvoudiging ✓ gebruik van logs ✓ antwoord (4)
6.3	$A = P(1 + i)^n$ of $A = 1\,200\,000 \left(1 + \frac{0,098}{12}\right)^{80}$ $A = 1\,229\,640,754 \left(1 + \frac{0,098}{12}\right)^{77}$ $= R2\,300\,212,589$ $F = \frac{x \left[(1 + i)^n - 1\right]}{i}$ $= \frac{15\,000 \left[\left(1 + \frac{0,098}{12}\right)^{77} - 1\right]}{0,098}$ $= R1\,599\,130,824$ Uitstaande balans = $R2\,300\,212,589 - R1\,599\,130,824$ $= R701\,081,76$ Reeds betaal = $77(R15\,000)$ $= R1\,155\,000$ Totale koste na 77 maande = $R1\,155\,000 + R701\,081,76$ $= R1\,856\,081,767$ ∴ 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 = $R1\,155\,000 + R701\,081,76$ $= R1\,856\,081,767$ $\therefore \text{Wins} = R2\,000\,000 - R1\,856\,081,767$ $= R143\,918,24$	✓ n ✓ substitusie in P formule ✓ uitstaande balans ✓ paaielemente betaal ✓ totale koste ✓ wins (6)
	[13]

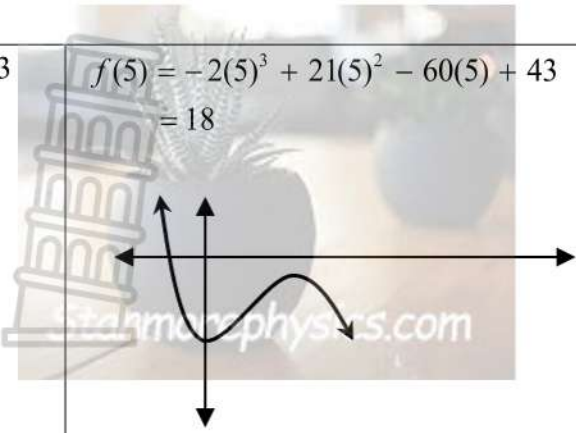
VRAAG 7

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	$f(x) = 2\sqrt[3]{x^4} + \frac{3}{x^5}$ $= 2x^{\frac{4}{3}} + 3x^{-5}$ $f'(x) = \frac{8}{3}x^{\frac{1}{3}} - 15x^{-6}$	$\checkmark 2x^{\frac{4}{3}} \quad \checkmark 3x^{-5}$ $\checkmark \frac{8}{3}x^{\frac{1}{3}} \quad \checkmark -15x^{-6}$
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

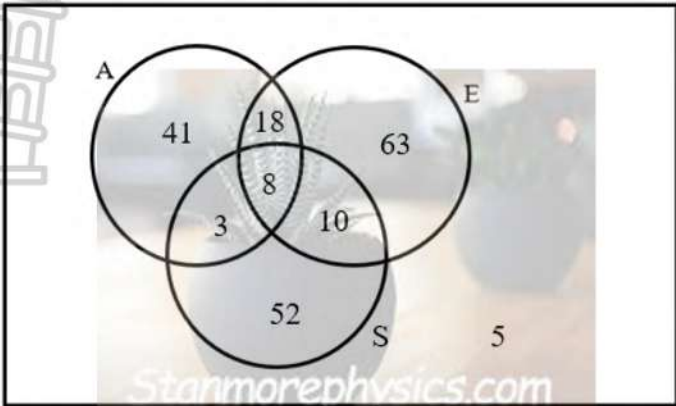
8.1	$f(x) = -2x^3 + 21x^2 - 60x + 43$ $f'(x) = -6x^2 + 42x - 60$ $0 = -6x^2 + 42x - 60$ $0 = x^2 - 7x + 10$ $0 = (x - 2)(x - 5)$ $x_A = 2 \text{ of } x_B = 5$	$\checkmark 0 = -6x^2 + 42x - 60$ $\checkmark$ faktore $\checkmark$ beide antwoorde
8.2	$f''(x) = -12x + 42 \quad \text{OF} \quad x = \frac{5+2}{2}$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

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	$P(A) \times P(S) = \frac{70}{200} \times \frac{73}{200}$ $= \frac{511}{4\,000} \approx 0,13$ $P(A \text{ en } S) = \frac{11}{200} = 0,06$ $\therefore P(A) \times P(S) \neq P(A \text{ en } S)$ $\therefore$ 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							
	VRAAG	KENNIS VLAK 1 (20%)	ROETINE PROSEDURES VLAK 2 (35%)	KOMPLEKSE PROSEDURES VLAK 3 (30%)	PROBLEEM OPLOSSING VLAK 4 (15%)	ALGEBRA	PATRONE	FUNKSIES	FINANSIES	DIFFERENSIASIE	WAARSKYNNLIK- 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

	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	WAARSKYNNLIK- 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%							
Pol	20%	35%	30%	15%	25	25	35	15	35	15	150