education

Department:
Education
North West Provincial Government
REPUBLIC OF SOUTH AFRICA

PROVINCIAL ASSESSMENT

GRADE 12

MATHEMATICS P1

JUNE 2026

MARKS: 150

TIME: 3 hours

This question paper consists of 10 pages, 1 information sheet and an answer book of 18 pages.

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. that 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 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 $x^2 + x - 30 = 0$ (3)

1.1.2 $2x^2 - 8 = 5x$ (correct to TWO decimal places) (4)

1.1.3 $-7x^2 < -14x$ (4)

1.1.4 $\sqrt{x+6} - x = 4$ (5)

1.1.5 $4^x - 16 = 6.2^x$ (4)

1.2 Solve for x and y simultaneously:

$x + 2y + 5 = 0$ and $y^2 + x^2 + 10x + 5 = 0$ (6)

1.3 Given the irrational: number $\frac{16}{\sqrt{2}}$:

1.3.1 Show that $\frac{16}{\sqrt{2}}$ can be written as $8\sqrt{2}$. (1)

1.3.2 Hence, show that $\frac{16}{\sqrt{2}} = 8a + 8b$ if $(a+b) > 0$ and $(a+b)^2 = 2$. (3)

[30]

QUESTION 2

The sequence of the first differences of a quadratic pattern is:

107; 113; 119; …

The third term of the quadratic number pattern is 320.

2.1 Write down the first four terms of the quadratic number pattern. (3)

2.2 Determine the general term (T_n) of the quadratic number pattern. (4)

2.3 Between which two consecutive terms of the quadratic number pattern will the first difference be 2 021? (4)

[11]

QUESTION 3

3.1 Given the arithmetic series: $6+13+20+27+...$

3.1.1 Determine the value of the 24^{th} term. (3)

3.1.2 Calculate the sum of the first 50 terms of the series. (2)

3.2 Find the value of m:

$$\sum_{k=1}^{m} 12\left(\frac{1}{3}\right)^{k-1} = \frac{1456}{81}$$

(5)

3.3 The first two terms of a geometric series are $x+2$ and x^2-2x-8.

3.3.1 For which values of x will the series converge? (2)

3.3.2 If the sum to infinity of the series is $\frac{11}{3}$, determine the value of x. (4)

[16]

QUESTION 4

Prove, WITHOUT USING A FORMULA, that:

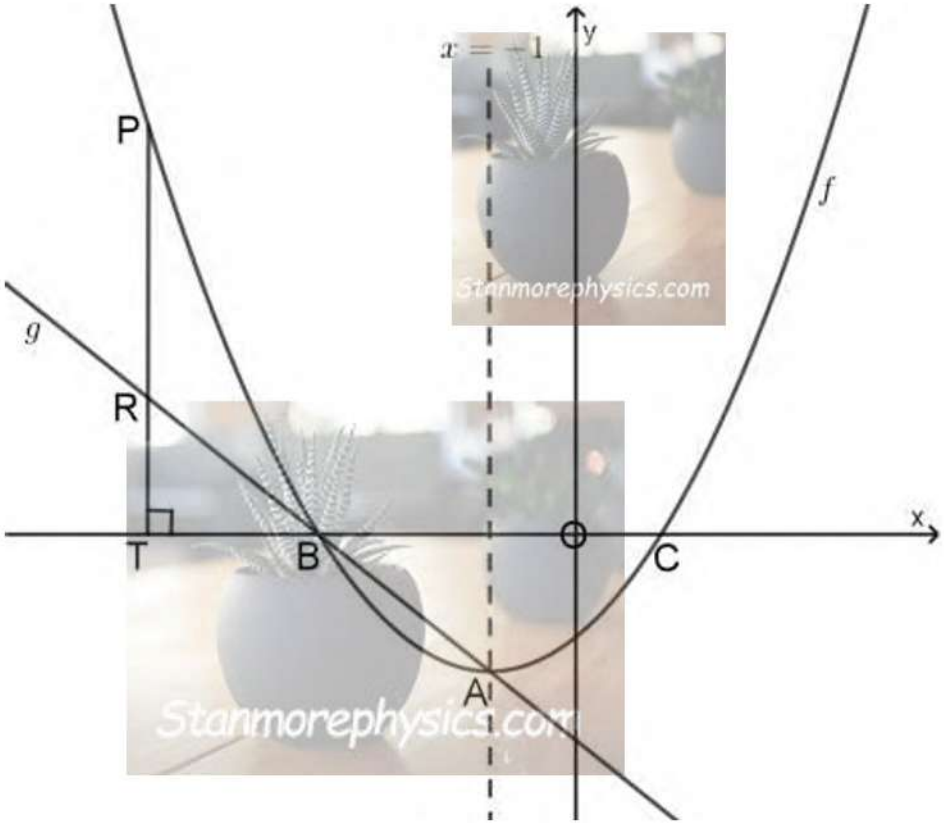
$$p+\frac{p}{2}+\frac{p}{4}+\frac{p}{8}+...+\frac{p}{2^n}=p\left(2-\frac{1}{2^n}\right)$$

[5]

QUESTION 5

In the diagram below, the graphs of $f(x) = ax^2 + bx + c$ and $g(x) = -4x - 12$, are drawn.

- B and C are the x-intercepts of f.
- C is the x-intercept of g.
- f and g intersect at A and C.
- A is the turning point of f.
- The line $x = -1$ is the axis of symmetry of f.



5.1 Determine the coordinates of A, B and C. (4)

5.2 Show that $f(x) = 2x^2 + 4x - 6$. (3)

5.3 Write down the coordinates of the turning point of $f(x-3) - 2$. (2)

5.4 Write down the value of k if $f(x) = k$ has equal roots. (1)

5.5 Write down the range for $-f(x)$. (2)

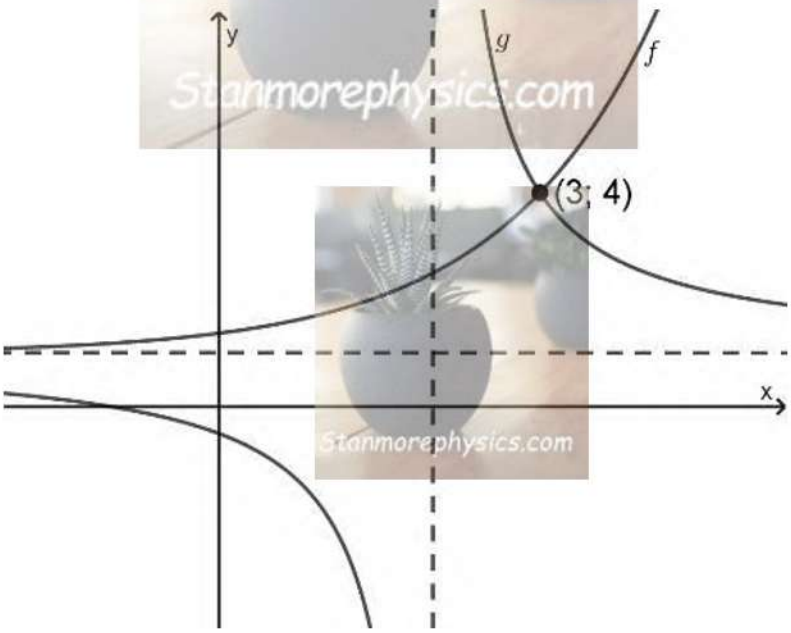
5.6 If $f(x) = 2x^2 + 4x - 6$, determine the length of OT if PRT is perpendicular to the x-axis with P a point on f, R is a point on g and PRT = 16 units. (6)

[18]

QUESTION 6

Sketched below are the graphs of $f(x) = 3.2^{x-p} + q$ and $g(x) = \frac{a}{x+k} + c$.

The asymptotes of g are $x = 2$ and $y = 1$.
The asymptote of f is $y = 1$.



6.1 Determine the equation of g. (4)

6.2 Determine the values of p and q. (4)

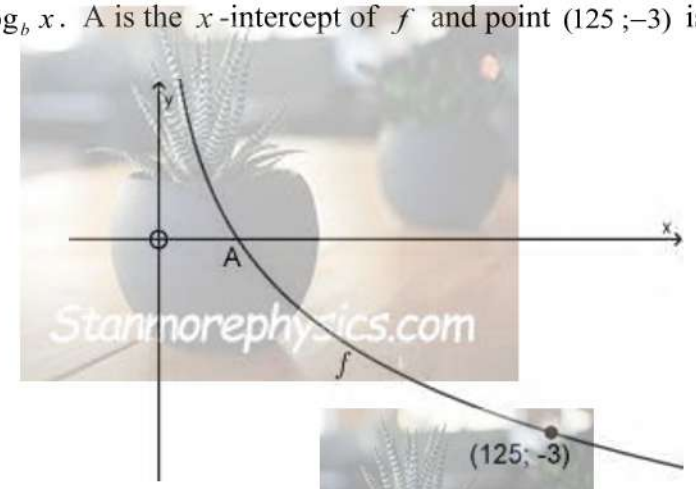
6.3 For which values of x is $f(x) \leq g(x)$? (2)

6.4 Determine the equation of the axis of symmetry of h for $m < 0$ if $h(x) = g(x) + 2$. (3)

[13]

QUESTION 7

Given: $f(x) = \log_b x$. A is the x-intercept of f and point $(125\ ;-3)$ is on f.



7.1 Determine the value of b. (3)

7.2 Write down the coordinates of A. (2)

7.3 For which value(s) of x is $f(x) \geq -3$? (2)

7.4 Write down the equation of f^{-1}, the inverse of f, in the form $y = ...$ (2)

7.5 Sketch the graph of f^{-1} on the set of axes provided in the ANSWER BOOK. Clearly indicate the y-intercept with the axes, at least the coordinates of ONE other point and the asymptote on your graph. (3)

7.6 $h(x)$ is the reflection of f^{-1} about the x-axis. Write down the equation of $h(x)$. (1)

[13]

QUESTION 8

8.1 Determine $f'(x)$ from first principles if $f(x) = 3 - 2x^2$. (5)

8.2 Determine:

8.2.1 $f'(x)$ if it is given that $f(x) = -x^5 + 3x^4$ (2)

8.2.2 $\frac{dy}{dx}$ if $yx = 7x^3 - 5x^{\frac{2}{3}}$ (4)

8.3 The tangent to the curve of $g(x) = 2x^3 + px^2 + qx - 7$ at $x = 1$ has the equation $y = 5x - 8$.

8.3.1 Show that $(1; -3)$ is the point of contact of the tangent to the graph of g. (1)

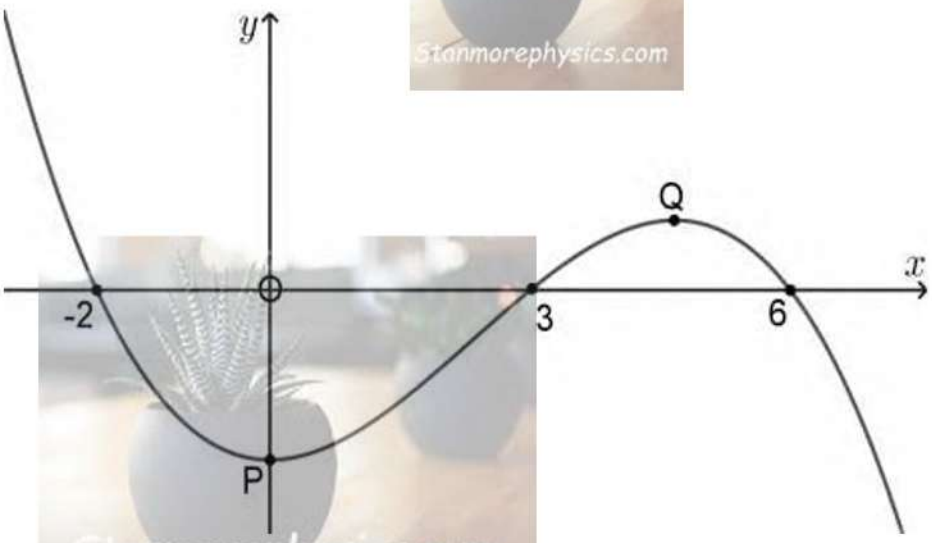
8.3.2 Hence, calculate the values of p and q. (6)

[18]

QUESTION 9

Sketched below is the graph of $f(x) = -x^3 + ax^2 + bx + c$.

- P and Q are the turning points of f.
- $x = -2$; $x = 3$ and $x = 6$ are the x-intercepts of f.



9.1 Show that $a = 7$; $b = 0$ and $c = -36$. (2)

9.2 Calculate the coordinates of the turning points P and Q. (5)

9.3 Determine the x-coordinate of the point of inflection. (3)

9.4 For which values of x will $x.f'(x) > 0$? (2)

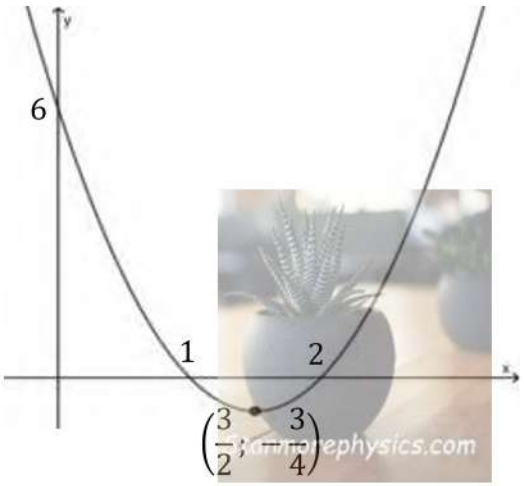
9.5 For which value of k will $f(x) - 4 = k$ have one root? (2)

[14]

QUESTION 10

The graph of $f'(x)$ is drawn below.

- 6 is the y-intercept of f'.
- 1 and 2 are the x-intercepts and $\left(\frac{3}{2};-\frac{3}{4}\right)$ is the turning point of f' respectively.



10.1 Write down the x-coordinate of the minimum turning point of $f(x)$. (1)

10.2 For which values of x will $f(x)$ be decreasing? (2)

10.3 Write down the gradient of the tangent to f if $x=0$. (1)

10.4 At which other x-value will a tangent to f be parallel to the answer in QUESTION 10.3? (1)

10.5 Is $f(x)$ concave up or concave down for $x>\frac{3}{2}$? (1)
[6]

QUESTION 11

A body moves according to the formulae $S(t) = 100t^2 - 200t + 300$, where S is the distance in meters, from a fixed point P, after t seconds.

11.1 Determine the distance from P after 10 seconds. (2)

11.2 Determine after how many seconds the body will reach a speed of 600 m/s. (2)

11.3 After how many seconds will the body reach its minimum distance from P? (2)

[6]

TOTAL: 150

INFORMATION SHEET

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

$$A = P(1+i.n) \qquad A = P(1-i.n) \qquad A = P(1-i)^n \qquad A = P(1+i)^n$$

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

$$T_n = ar^{n-1} \qquad S_n = \frac{a\left(r^n - 1\right)}{r-1} \;;\; r \neq 1 \qquad S_\infty = \frac{a}{1-r} \;;\; -1 < r < 1$$

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

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

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

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

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

$$y = mx + c \qquad y - y_1 = m(x - x_1) \qquad m = \frac{y_2 - y_1}{x_2 - x_1} \qquad m = \tan\theta$$

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

In ΔABC: $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

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

$$area\,\Delta ABC = \frac{1}{2}ab.\sin C$$

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

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

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

$$\bar{x} = \frac{\sum fx}{n} \qquad \sigma^2 = \frac{\sum_{i=1}^{n}\left(x_i - \bar{x}\right)^2}{n}$$

$$P(\mathrm{A}) = \frac{n(\mathrm{A})}{n(\mathrm{S})} \qquad \mathrm{P(A\ or\ B) = P(A) + P(B) - P(A\ and\ B)}$$

$$\hat{y} = a + bx \qquad b = \frac{\sum(x - \bar{x})(y - \bar{y})}{\sum(x - \bar{x})^2}$$

LEARNER'S NAME/*NAAM VAN LEERDER*

PROVINCIAL ASSESSMENT/ *PROVINSIALE ASSESSERING*

MATHEMATICS P1/*WISKUNDE V1*

GRADE 12/*GRAAD 12*

JUNIE/*JUNE* 2026

SPECIAL ANSWER BOOK/ *SPESIALE ANTWOORDEBOEK*

QUESTION/ *VRAAG*	MARK/ *PUNT*	INITIAL/ *PARAAF*	MODERATOR
1			
2			
3			
4			
5			
6			
7			
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.	1. Skryf jou naam in die ruimte soos verskaf.
2. No pages may be torn OR ADDED from this answer book.	2. Geen bladsy mag uit hierdie antwoordeboek geskeur word OF BYGEVOEG WORD nie.
3. Read the instructions given in the examination paper carefully.	3. Lees die instruksies wat in die eksamen vraestel gegee word, sorgvuldig deur.
4. Learners may not retain any answer book or remove them from the examination room.	4. Leerders mag geen antwoordeboek behou of uit die eksamenlokaal verwyder nie.
5. Answers must be written in black/blue ink as distinctly as possible.	5. Skryf die antwoorde so duidelik moontlik met swart/blou ink.
6. Draw a neat line through any work/rough work that must not be marked.	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		(3)
1.1.2		(4)
1.1.3		(4)
1.1.4		(5)
1.1.5		(4)

1.2		(6)
1.3.1		(1)
1.3.2		(3)
		[30]

QUESTION/*VRAAG* 2

	Solution/*Oplossing*	**Marks/ *Punte***
2.1		(3)
2.2		(4)
2.3		(4)
		[11]

QUESTION/*VRAAG* 3

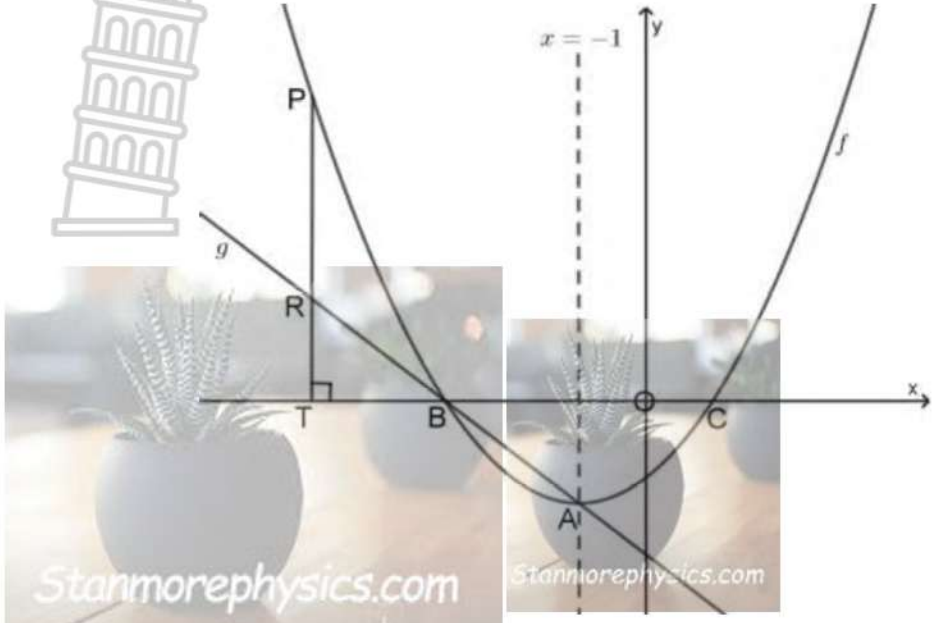
	Solution/*Oplossing*	**Marks/ *Punte***
3.1.1		(3)

3.1.2		(2)
3.2		(5)
3.3.1		(2)
3.3.2		(4)
		[16]

QUESTION/*VRAAG* 4

	Solution/*Oplossing*	**Marks/ *Punte***
4.		
		(5)
		[5]

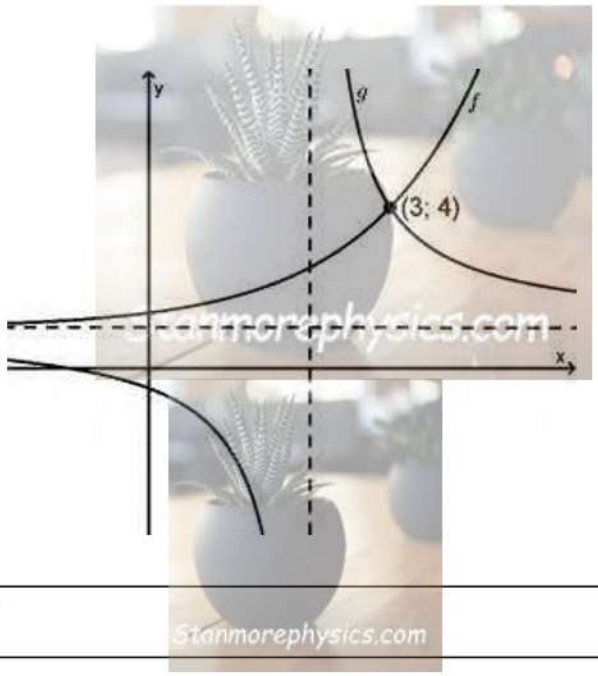
QUESTION/*VRAAG* 5



	Solution/*Oplossing*	**Marks/ *Punte***
5.1		(4)
5.2		(3)
5.3		(2)

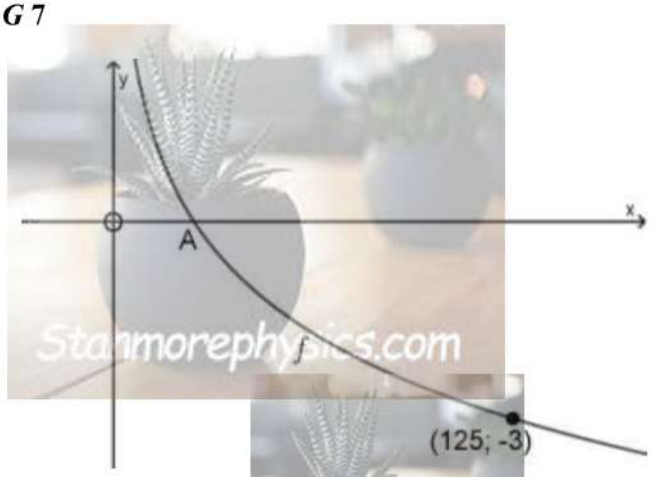
5.4		(1)
5.5		(2)
5.6		(6)
		[18]

QUESTION/*VRAAG* 6

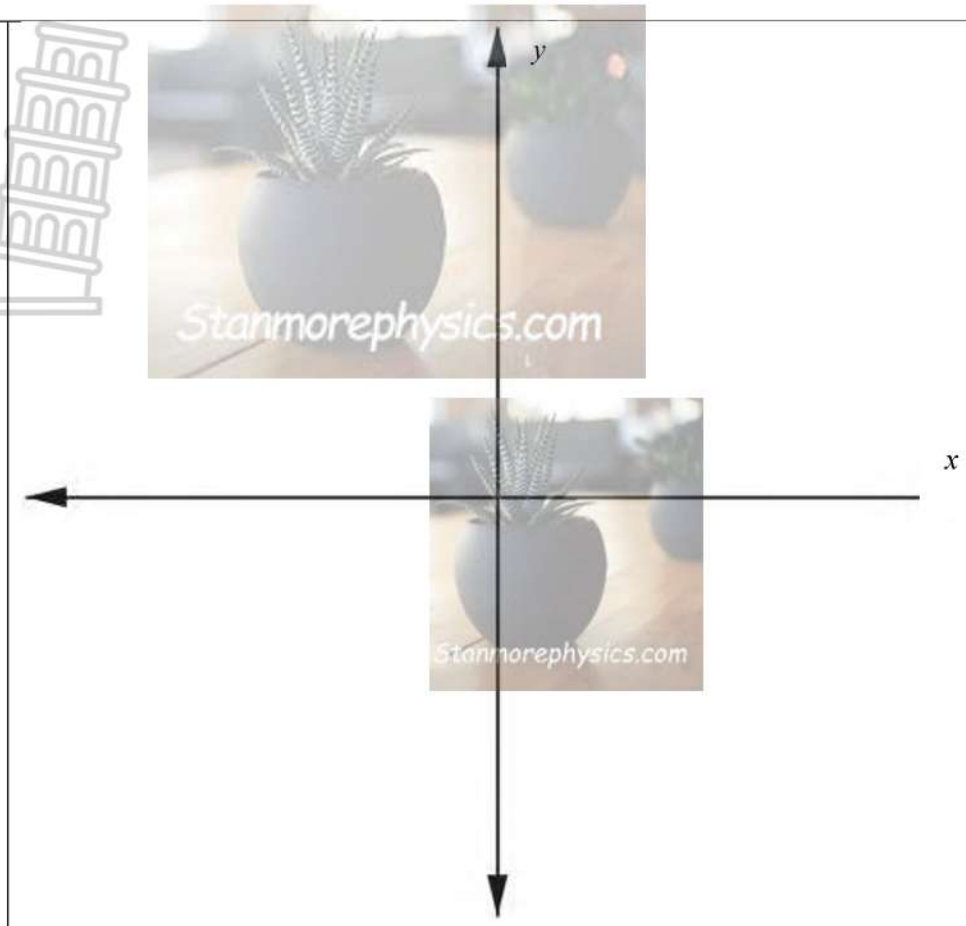


	Solution/*Oplossing*	**Marks/ *Punte***
6.1		(4)
6.2		(4)
6.3		(2)
6.4		(3)
		[13]

QUESTION/*VRAAG* 7



	Solution/*Oplossing*	**Marks/ *Punte***
7.1		(3)
7.2		(2)
7.3		(2)
7.4		(2)

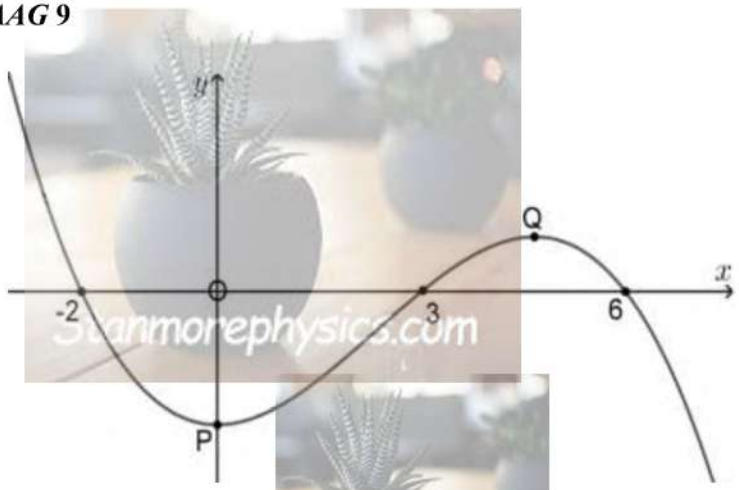
7.5		(3)
7.6		(1)
		[13]

QUESTION/*VRAAG* 8

	Solution/*Oplossing*	**Marks/ *Punte***
8.1		(5)

8.2.1		(2)
8.2.2		(4)
8.3.1		(1)
8.3.2		(6)
		[18]

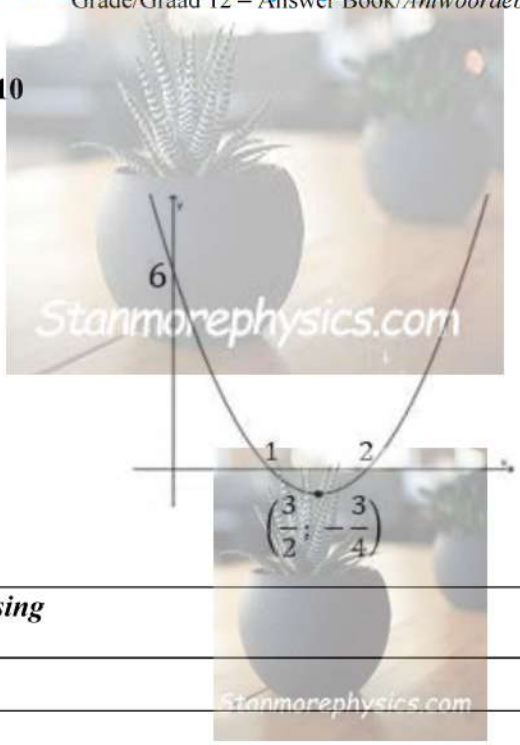
QUESTION/*VRAAG* 9



	Solution/*Oplossing*	**Marks/ *Punte***
9.1		(2)
9.2		(5)

9.3		(3)
9.4		(2)
9.5		(2)
		[14]

QUESTION/*VRAAG* 10



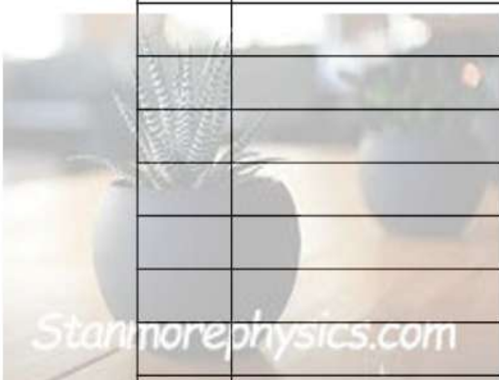
	Solution/*Oplossing*	**Marks/ *Punte***
10.1		(1)
10.2		(2)
10.3		(1)
10.4		(1)
10.5		(1)
		[9]

QUESTION/*VRAAG* 11

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

	Additional space/*Addisionele spasie*	**Marks/ *Punte***

	Additional space/*Addisionele spasie*	**Marks/ *Punte***



TOTAL/*TOTAAL*: 150

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REPUBLIC OF SOUTH AFRICA

PROVINCIAL ASSESSMENT/ PROVINSIALE ASSESSERING

GRADE 12/ GRAAD 12

MATHEMATICS P1/WISKUNDE V1

JUNE/JUNIE 2026

MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS/PUNTE: 150

These marking guidelines consist of 12 pages./
Hierdie nasienriglyne bestaan uit 12 bladsye.

NOTE:

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

LET WEL:

- *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	$x^2 + x - 30 = 0$ $(x + 6)(x - 5) = 0$ $x = -6$ or/*of* $x = 5$	✓factors/*faktore* ✓$x = -6$ ✓$x = 5$	(3)
1.1.2	$2x^2 - 8 = 5x$ $2x^2 - 5x - 8 = 0$ $x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(2)(-8)}}{2(2)}$ $= -1{,}11$ or/*of* $x = 3{,}61$	✓std form/*vorm* ✓subst ✓$x = -1{,}11$ ✓$x = 3{,}61$	(4)
1.1.3	$-7x^2 < -14x$ $-7x^2 + 14x < 0$ $x^2 - 2x > 0$ $x(x - 2) > 0$ $x < 0$ or/*of* $x > 2$ **OR/*OF*** $-7x^2 < -14x$ $-7x^2 + 14x < 0$ $-x^2 + 2x < 0$ $-x(x - 2) < 0$ $x < 0$ or/*of* $x > 2$	✓std form/*vorm* ✓factors/*faktore* ✓✓answer/*antwoord* **OR/*OF*** ✓std form/*vorm* ✓factors/*faktore* ✓✓answer/*antwoord*	(4)

1.1.4	$\sqrt{x+6}-x=4$ $\sqrt{x+6}=x+4$ $x+6=x^2+8x+16$ $x^2+7x+10=0$ $(x+5)(x+2)=0$ $x\neq -5$ or/*of* $x=-2$	✓isolate/*isoleer* $\sqrt{}$ ✓squaring both sides/ *kwadreer albei kante* ✓std form/*vorm* ✓factors/*faktore* ✓$x\neq -5$ or/*of* $x=-2$	(5)
1.1.5	$4^x-16=6\cdot 2^x$ $2^{2x}-6.2^x-16=0$ $(2^x-8)(2^x+2)=0$ $2^x=2^3$ or/of $2^x=-2$ $x=3$ no solution/geen oplossing	✓std form/*vorm* ✓factors/*faktore* ✓$x=3$ ✓no solution/*geen oploss*	(4)
1.2	$x+2y+5=0$ . . . . . ① $y^2+x^2+10x+5=0$ . . . . ② $x=-2y-5$ . . . . . ③ $\therefore y^2+(-2y-5)^2+10(-2y-5)+5=0$ $y^2+4y^2+20y+25-20y-50+5=0$ $5y^2-20=0$ $y^2-4=0$ $(y+2)(y-2)=0$ $y=-2$ or/*of* $y=2$ $x=-2(-2)-5$ or/*of* $x=-2(2)-5$ $=-1$ $=-9$	✓3rd equation/*vergelyking* ✓subst ✓std form/*vorm* ✓factors/*faktore* ✓*y*-values/*waardes* ✓*x*-values/*waardes*	(6)
1.3.1	$\frac{16}{\sqrt{2}}\times\frac{\sqrt{2}}{\sqrt{2}}=\frac{16\sqrt{2}}{2}=8\sqrt{2}$	✓rationlise/*rasionaliseer*	(1)
1.3.2	$(a+b)^2=2$ or $a+b=\pm\sqrt{2}$ But/*maar* $a+b>0$ $\therefore a+b=\sqrt{2}$ $8(a+b)=8\sqrt{2}$ $\therefore 8a+8b=8\sqrt{2}$ $\therefore 8a+8b=\frac{16}{\sqrt{2}}$	✓$\sqrt{}$ both sides/*albei kante* ✓ $a+b=\sqrt{2}$ ✓ $\times 8$	(3)
			[30]

QUESTION/*VRAAG* 2			
2.1	100; 207; 320; 439	✓100 ✓207 ✓439	(3)
2.2	$2a=6;\ a=3$ $3(3)+b=107;\ b=98$ $3+98+c=100;\ c=-1$ $T_n=3n^2+98n-1$	✓ $2a=6$; ✓$a=3$ ✓ $b=98$ ✓ $c=-1$	(4)
2.3	$T_n=6n+101$ $2021=6n+101$ $1920=6n$ $\therefore n=320$ ∴Between/*Tussen* T_{320} and/*en* T_{321}	✓$T_n=6n+101$ ✓subst $T_n=2021$ ✓320 ✓T_{320} and/*en* T_{321}	(4)
			[11]

QUESTION/*VRAAG* 3			
3.1.1	$6 + 13 + 20 + 27 + \ldots$ $T_n = a + (n-1)d$ $= 6 + (n-1)7$ $= 7n - 1$ $T_{24} = 7(24) - 1$ $= 167$		✓$7n-1$ ✓subst ✓answer/*antwoord* (3)
3.1.2	$S_n = \frac{n}{2}[2a + (n-1)d]$ $S_{50} = \frac{50}{2}[2(6) + 49(7)]$ $= 8875$	$S_n = \frac{n}{2}[a + l]$ $S_{50} = \frac{50}{2}(6 + 349)$ $= 8875$	✓subst ✓answer/*antwoord* (2)
3.2	$\sum_{k=1}^{m} 12\left(\frac{1}{3}\right)^{k-1} = \frac{1456}{81}$ $\therefore 12 + 4 + \frac{4}{3} + \frac{4}{9} + \ldots$ $\frac{12\left[1 - \left(\frac{1}{3}\right)^m\right]}{1 - \frac{1}{3}} = \frac{1456}{81}$ $1 - \left(\frac{1}{3}\right)^m = \frac{728}{729}$ $\left(\frac{1}{3}\right)^m = \frac{1}{729}$ $\left(\frac{1}{3}\right)^m = \left(\frac{1}{3}\right)^6$ **OR/OF** $3^{-m} = 3^{-6}$ $\therefore m = 6$		✓1st three terms/*1e drie terme* ✓subst ✓$\frac{728}{729}$ ✓exp law/*eksp wet* ✓answer/*antwoord* (5)
3.3.1	$(x+2) + (x^2 - 2x - 8) + \ldots$ $r = \frac{x^2 - 2x - 8}{x+2} = \frac{(x+2)(x-4)}{x+2} = x - 4$ $\therefore -1 < x - 4 < 1$ $\therefore 3 < x < 5$		✓$r = x - 4$ ✓answer/*antwoord* (2)
3.3.2	$a = x + 2;\ r = x - 4;\ S_\infty = \frac{11}{3}$ $\frac{11}{3} = \frac{x+2}{1-(x-4)}$ $3(x+2) = 11(-x+5)$ $3x + 6 = -11x + 55$ $14x = 49$ $\therefore x = \frac{7}{2}$		✓subst/*vervang a* and/*en r* ✓subst $\frac{11}{3}$ ✓simplify/*vereenv* ✓answer/*antwoord* (4)
			[16]

QUESTION/*VRAAG* 4

$S_n = p + \frac{p}{2} + \frac{p}{4} + \frac{p}{8} + \ldots + \frac{p}{2^n} \quad \ldots ①$

$\frac{1}{2} \cdot S_n = \frac{p}{2} + \frac{p}{4} + \frac{p}{8} + \ldots + \frac{p}{2^n} + \frac{p}{2^{n+1}} \quad \ldots ②$ ✓ $\times \frac{1}{2}$

① − ②:

$S_n - \frac{1}{2} \cdot S_n = p - \frac{p}{2^{n+1}}$ ✓subtract eq/*minus vergl*

$S_n\left(1 - \frac{1}{2}\right) = p\left(1 - \frac{1}{2^{n+1}}\right)$ ✓factorise/*faktoriseer*

$S_n = 2p\left(1 - \frac{1}{2^{n+1}}\right)$ ✓ $\div \frac{1}{2}$ both sides/*albei kante*

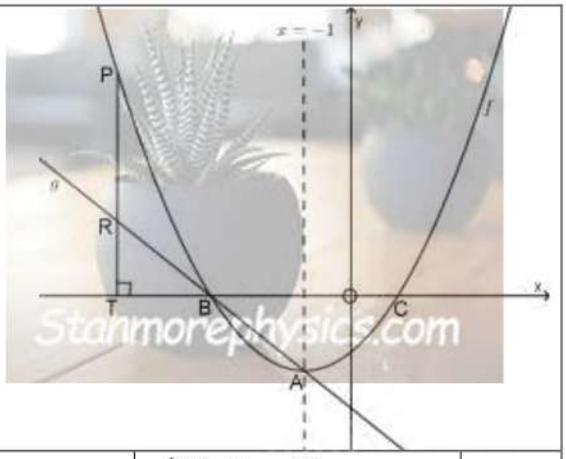
$= p\left(2 - \frac{2}{2^n.2}\right)$ ✓ $2 - \frac{2}{2^n.2}$

$= p\left(2 - \frac{1}{2^n}\right)$

[5]

QUESTION/*VRAAG* 5

$f(x) = ax^2 + bx + c$
$g(x) = -4x - 12$



5.1	$A(-1;\ -8)$ x −intercept/*afsnit*: $y = 0$ $\therefore 0 = -4x - 12$ $\therefore 4x = -12$ $\therefore x = -3$ $B(-3;0)$ $C(1;0)$	✓$A(-1;\ -8)$ ✓$y = 0$ ✓B ✓C	(4)
5.2	$y = a(x - x_1)(x - x_2)$ $-8 = a(-1 + 3)(-1 - 1)$ $-8 = -4a$ $\therefore a = 2$ $f(x) = 2(x + 3)(x - 1)$ $= 2x^2 + 4x - 6$	✓subst A, B & C ✓ $a = 2$ ✓subst $a = 2$	(3)

	OR/*OF* $y = a(x+p)^2 + q$ $0 = a(1+1)^2 - 8$ $4a = 8$ $a = 2$ $\therefore y = 2(x+1)^2 - 8$ $= 2(x^2 + 2x + 1) - 8$ $= 2x^2 + 4x - 6$	✓subst A & B or/*of* C ✓ $a = 2$ ✓subst $a = 2$	(3)
5.3	$\therefore (2; -10)$	✓$x = 2$ ✓$y = -10$	(2)
5.4	$k = -8$	✓$k = -8$	(1)
5.5	$(-\infty;\ 8]$ **OR/*OF*** $y \leq 8;\ y \in \mathbb{R}$	✓✓answer/*antwoord*	(2)
5.6	$f(x) = 16$ $2x^2 + 4x - 6 = 16$ $2x^2 + 4x - 22 = 0$ $x^2 + 2x - 11 = 0$ $x = \dfrac{-2 \pm \sqrt{4 - 4(1)(-11)}}{2(1)}$ $x = -4{,}46$ or/*of* $x = 2{,}46$ N/A $\therefore OT = 4{,}46$ units/*eenhede*	✓$f(x) = 16$ ✓std form/*vorm* ✓subst ✓x –values/*waardes* ✓selection of x ✓ $OT = 4{,}46$	(6)
			[18]

QUESTION/*VRAAG* 6

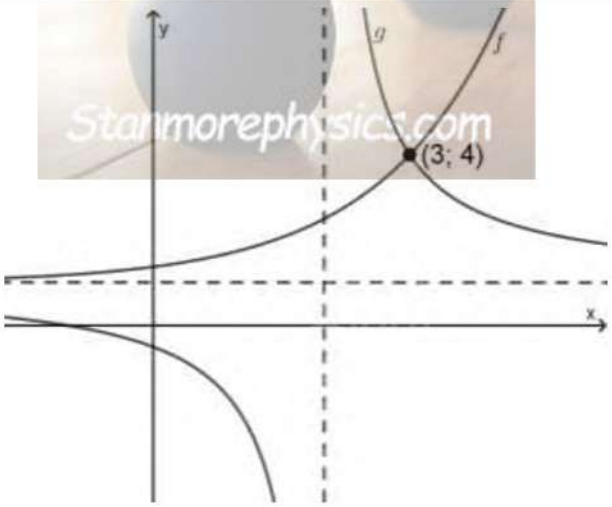
Given/*Gegee*:

$f(x) = 3.2^{x-p} + q$

$g(x) = \dfrac{a}{x+k} + c$

The asymptotes of g are $x = 2$ and $y = 1$
The asymptote of f is $y = 1$.

Die asimptote van g *is* $x = 2$ *en* $y = 1$
Die asimptote van f *is* $y = 1$.

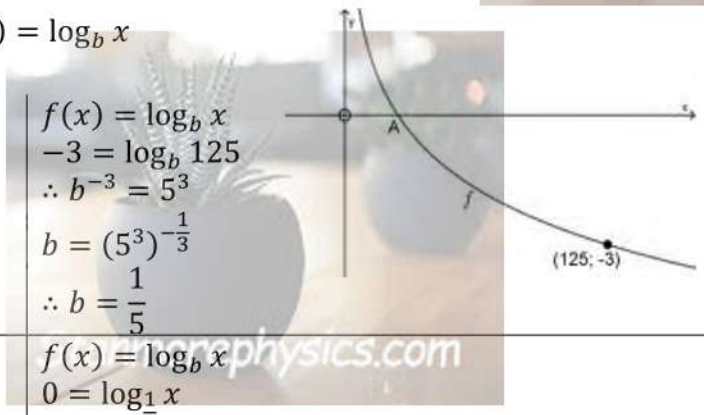


6.1	$c = 1\ ;\ k = -2$ $g(x) = \dfrac{a}{x+k} + c$ $4 = \dfrac{a}{3-2} + 1$ $3 = a$ $\therefore g(x) = \dfrac{3}{x-2} + 1$	✓$c = 1$ ✓$k = -2$ ✓subst (3; 4) ✓answer/*antwoord*	(4)

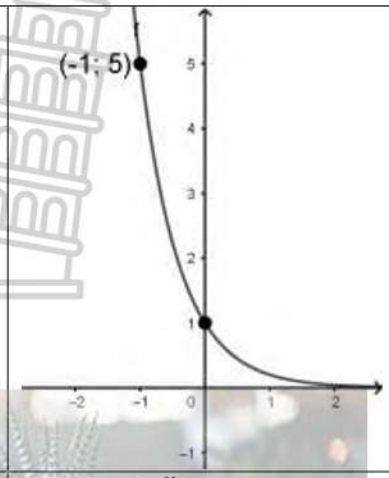
6.2	$q = 1$ and/*en* $(3; 4)$ $f(x) = 3.2^{x-p} + q$ $4 = 3.2^{3-p} + 1$ $3 = 3.2^{3-p}$ $1 = 2^{3-p}$ $2^0 = 2^{3-p}$ $\therefore p = 3$	✓$q = 1$ ✓subst (3; 4) ✓exp law/*eksp wet* ✓ $p = 3$	(4)
6.3	$(2; 3]$ **OR/*OF*** $2 < x \leq 3$	✓x-values/*waardes* ✓notation/*notasie*	(2)
6.4	$(2;\ 1) \rightarrow (2;\ 3)$ $\therefore y = -x + c$ $3 = -2 + c$ $5 = c$ $\therefore y = -x + 5$	✓$(2;\ 3)$ ✓subst ✓answer/*antwoord*	(3)
			[13]

QUESTION/*VRAAG* 7

$f(x) = \log_b x$



7.1	$f(x) = \log_b x$ $-3 = \log_b 125$ $\therefore b^{-3} = 5^3$ $b = (5^3)^{-\frac{1}{3}}$ $\therefore b = \frac{1}{5}$	✓subst (125; -3) ✓eksp form/*vorm* ✓$b = \frac{1}{5}$	(3)
7.2	$f(x) = \log_b x$ $0 = \log_{\frac{1}{5}} x$ $\therefore \left(\frac{1}{5}\right)^0 = x$ $\therefore x = 1$ $A(1; 0)$	✓1✓0	(2)
7.3	$x \in (0;\ 125]$ **OR/*OF*** $0 < x \leq 125$	✓critical values/*kritiese waardes* ✓notation/*notasie*	(2)
7.4	$x = \log_{\frac{1}{5}} y$ $y = \left(\frac{1}{5}\right)^x = 5^{-x}$	✓$x \leftrightarrow y$ ✓answer/*antwoord*	(2)

7.5		✓shape/*vorm* ✓coordinate/*koördinaat* ✓*y*-intercept/*afsnit*	(3)
7.6	$y = -\left(\frac{1}{5}\right)^x = -5^{-x}$	✓answer/*antwoord*	(1)
			[13]

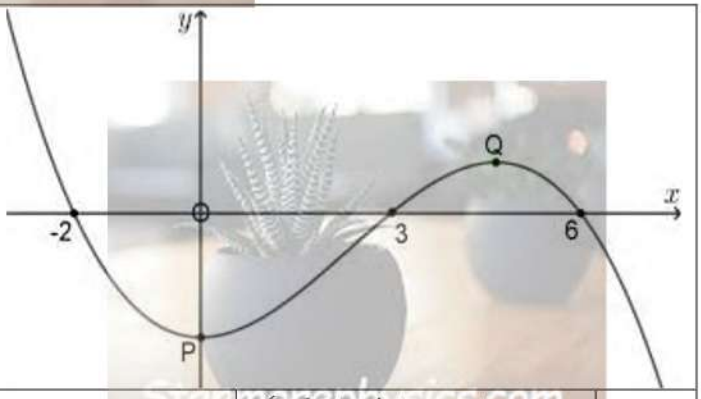
QUESTION/*VRAAG* 8

8.1	$f(x) = 3 - 2x^2$ $f(x+h) = 3 - 2(x+h)^2$ $= 3 - 2x^2 - 4xh - 2h^2$ $f'(x) = \lim_{h\to 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h\to 0} \frac{3 - 2x^2 - 4xh - 2h^2 - 3 + 2x^2}{h}$ $= \lim_{h\to 0} \frac{h(-4x - 2h)}{h}$ $= \lim_{h\to 0}(-4x - 2h)$ $= -4x$	✓$f(x+h)$ value/*waarde* ✓subst ✓simplification/*vereenv* ✓factors/*faktore* ✓answer/*antwoord*	(5)
8.2.1	$f(x) = -x^5 + 3x^4$ $f'(x) = -5x^4 + 12x^3$	✓$-5x^4$ ✓$+12x^3$	(2)
8.2.2	$yx = 7x^3 - 5x^{\frac{2}{3}}$ $y = 7x^2 - 5x^{-\frac{1}{3}}$ $\therefore \frac{dy}{dx} = 14x + \frac{5}{3}x^{-\frac{4}{3}}$	✓$7x^2$ ✓$5x^{-\frac{1}{3}}$ ✓$14x$ ✓$+\frac{5}{3}x^{-\frac{4}{3}}$	(4)

8.3.1	$y = 5x - 8$ $y = 5(1) - 8$ $\therefore y = -3$	✓subst	(1)
8.3.2	$g(x) = 2x^3 + px^2 + qx - 7$ through/*deur* (1; -3) $-3 = 2(1)^3 + p(1)^2 + q(1) - 7$ $p + q = 2$ $q = 2 - p \ldots\ldots\ldots\ldots\ldots ①$ $m = g'(1) = 5$ $6x^2 + 2px + q = 5$ $6(1)^2 + 2p(1) + q = 5$ $2p + q = -1$ $q = -1 - 2p \ldots\ldots\ldots\ldots ②$ $\therefore 2 - p = -1 - 2p$ $p = -3$ $q = 2 - (-3)$ $= 5$	✓subst (1;–3) in g ✓eqation 1/*verg 1* ✓subst in g' ✓eqation 2/*verg 2* ✓$p = -3$ ✓$q = 5$	(6)
			[18]

QUESTION/*VRAAG* 9

$f(x) = -x^3 + ax^2 + bx + c$



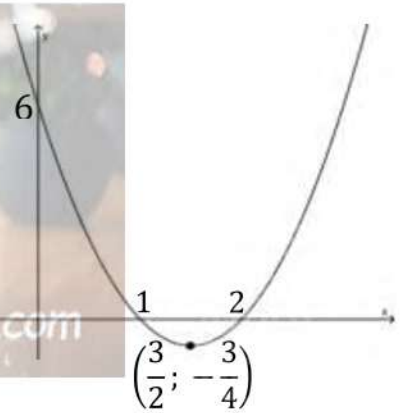
9.1	$f(x) = -(x + 2)(x - 3)(x - 6)$ $y = -(x + 2)(x^2 - 9x + 18)$ $= -x^3 + 7x^2 - 36$ $\therefore a = 7;\ b = 0;\ c = -36$	✓subst x-intercepts ✓simplify/vereenv	(2)
9.2	$f(x) = -x^3 + 7x^2 - 36$ $f'(x) = -3x^2 + 14x = 0$ $3x^2 - 14x = 0$ $x(3x - 14) = 0$ $x = 0$ or/*of* $x = \frac{14}{3}$ $f(0) = -(0)^3 + 7(0)^2 - 36$ $= -36$ $f\left(\frac{14}{3}\right) = -\left(\frac{14}{3}\right)^3 + 7\left(\frac{14}{3}\right)^2 - 36$ $= \frac{400}{27} = 14{,}81$ $\therefore Q\left(\frac{14}{3}; \frac{400}{27}\right)$ and/*en* $P(0; -36)$	✓$f'(x) = 0$ ✓factors/*faktore* ✓x –values/*waardes* ✓ $Q\left(\frac{14}{3}; \frac{400}{27}\right)$ ✓ $P(0; -36)$	(5)

9.3	$f(x) = -x^3 + 7x^2 - 36$ $f'(x) = -3x^2 + 14x$ $f''(x) = 0$ $\therefore -6x + 14 = 0$ $-6x = -14$ $\therefore x = \frac{7}{3} = 2{,}33$ **OR/*OF*** $x = \frac{0 + \frac{14}{3}}{2} = \frac{7}{3} = 2{,}33$	✓$f''(x)$ ✓$= 0$ ✓$x = \frac{7}{3}$	(3)
9.4	$x.f'(x) > 0$ $x < \frac{14}{3};\ x \neq 0$	✓ $x < \frac{14}{3}$ ✓ $x \neq 0$	(2)
9.5	$-x^3 + 7x^2 - 36 - 4 = k$ $\therefore f(x) = k + 4$ $\therefore k < -40$ or/of $k > \frac{292}{27}$	✓notation/*notasie* ✓values/*waardes*	(2)
			[14]

QUESTION/*VRAAG* 10

The graph of $f'(x)$ is drawn./*Die grafieke van* $f'(x)$ *is gegee.*

- 6 is the y-intercept of f'.
  6 is die y*-afsnit van* f'.
- 1 and 2 are the x-intercepts of f'
  1 en 2 is die x*-afsnitte van* f'
- $\left(\frac{3}{2}; -\frac{3}{4}\right)$ is the turning point of f'
  $\left(\frac{3}{2}; -\frac{3}{4}\right)$ *is die draaipunt van* f'



10.1	$x = 2$	✓answer/*antwoord*	(1)
10.2	$1 < x < 2$	✓values/*waardes* ✓notation/*notasie*	(2)
10.3	$x = 0$ at/*by* y −intercept/*afsnit* $\therefore m = 6$	✓$m = 6$	(1)
10.4	$x = 3$ (use symmetry/*gebruik simmetrie*)	✓$x = 3$	(1)
10.5	Concave up/*Konkaaf na bo*	✓answer/*antwoord*	(1)
			[6]

QUESTION/*VRAAG* 11			
11.1	$S = 100(10)^2 - 200(10) + 300$ $= 8\,300\ m$	✓subst $t = 10$ ✓answer/*antwoord*	(2)
11.2	$200t - 200 = 600$ $200t = 800$ $t = 4\ s$	✓$S' = 600$ ✓$t = 4\ s$	(2)
11.3	$200t - 200 = 0$ $200t = 200$ $t = 1\ s$	✓$S' = 0$ ✓$t = 1\ s$	(2)
			[6]

TOTAL/*TOTAAL*: 150