



**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

JUNE 2026

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MATHEMATICS P1

MARKS: 150

TIME: 3 hours

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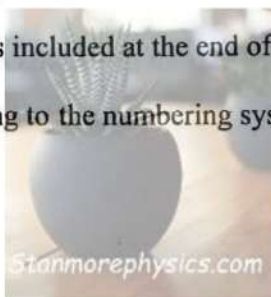


This question paper consists of 11 pages, including 1 information sheet
and an answer book of 26 pages.

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, et cetera 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. Number the answers correctly according to the numbering system used in this question paper.
10. Write neatly and legibly.



QUESTION 1

1.1 Solve for x :

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

1.1.2 $3x^2 - 5x - 4 = 0$ (correct to TWO decimal places) (3)

1.1.3 $3x^2 - 8x \geq 0$ (4)

1.1.4 $\frac{3}{2x} = \sqrt{\frac{6}{x}} - 1$ (5)

1.2 Solve simultaneously for x and y , if:

y is one less than, 3 times x

$x^2 + 2xy = 3y^2 - 7$ (6)

1.3 Given that: $x + y = 4$ and $xy = 1$. Without solving for x and y , determine a value for P , if $P = x^3 + y^3$.

(4)
[24]

QUESTION 2

2.1 $p + 3$; p ; $p - 2$ are the first three terms of a geometric sequence.

2.1.1 Determine the value(s) of p . (3)

2.1.2 Show that the sequence converges. (2)

2.1.3 Calculate S_{∞} (2)

2.2 Given the following series: $2 + 6 + 18 + \dots + 13\ 122$

2.2.1 Write the series in sigma notation. (3)

2.2.2 Calculate the sum. (2)
[12]

QUESTION 3

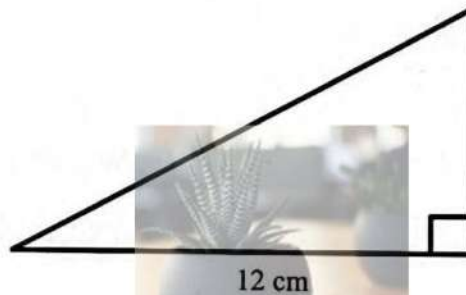
3.1 The following information of a quadratic pattern is given:

- General term of first differences, $d_n = 6n - 3$.
- $T_1 = 1$ (the first term of the quadratic number pattern)

3.1.1 Determine the values of the second and third terms of the quadratic number pattern. (2)

3.1.2 Determine the general term, T_n of the quadratic number pattern. (3)

3.2 The lengths of the sides of a right-angled triangle form an arithmetic sequence. If the second longest side has a length of 12 cm, determine the lengths of the other side and the hypotenuse.



(4)

3.3 Evaluate: $\sum_{p=5}^{20} (p+1)^2 - \sum_{p=5}^{20} p^2$

(4)

[13]

QUESTION 4

Given the function $f(x) = \frac{6}{x-4} + 3$, where $x \in \mathbb{R}$

4.1 Write down the domain of f . (1)

4.2 Write down the equation of the horizontal asymptote of f . (1)

4.3 Determine the x - and y -intercepts of f . (3)

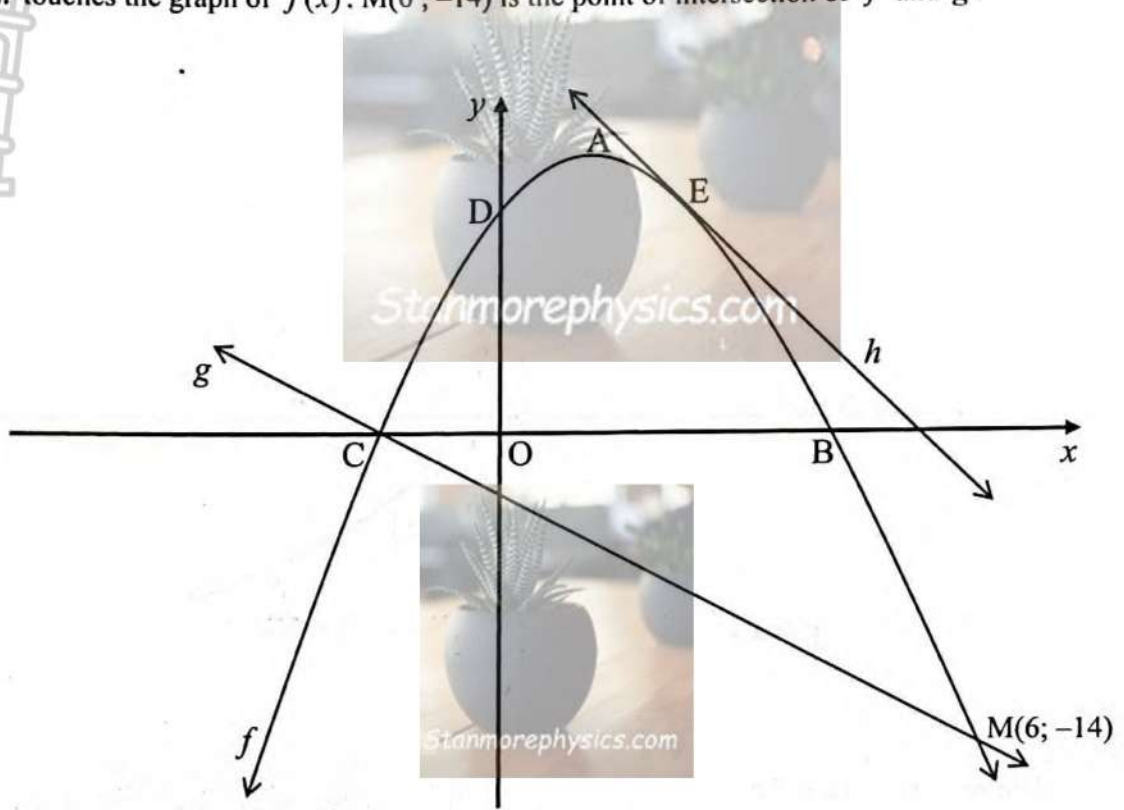
4.4 Sketch the graph of $f(x)$, showing the asymptotes and the intercepts with the axes. (3)

4.5 For which values of x is $f(x) \leq 0$? (2)

[10]

QUESTION 5

The sketch below represents the graphs of $f(x) = -2x^2 + 8x + 10$ and $g(x) = mx + c$. A is the turning point of $f(x)$. B, C and D are the intercepts with the axes. E is the point where the tangent, h touches the graph of $f(x)$. $M(6; -14)$ is the point of intersection of f and g .



5.1 Determine:

5.1.1 The coordinates of A, the turning point of f (2)

5.1.2 The length of BC (3)

5.2 Determine the equation of g , in the form $y = \dots$ (2)

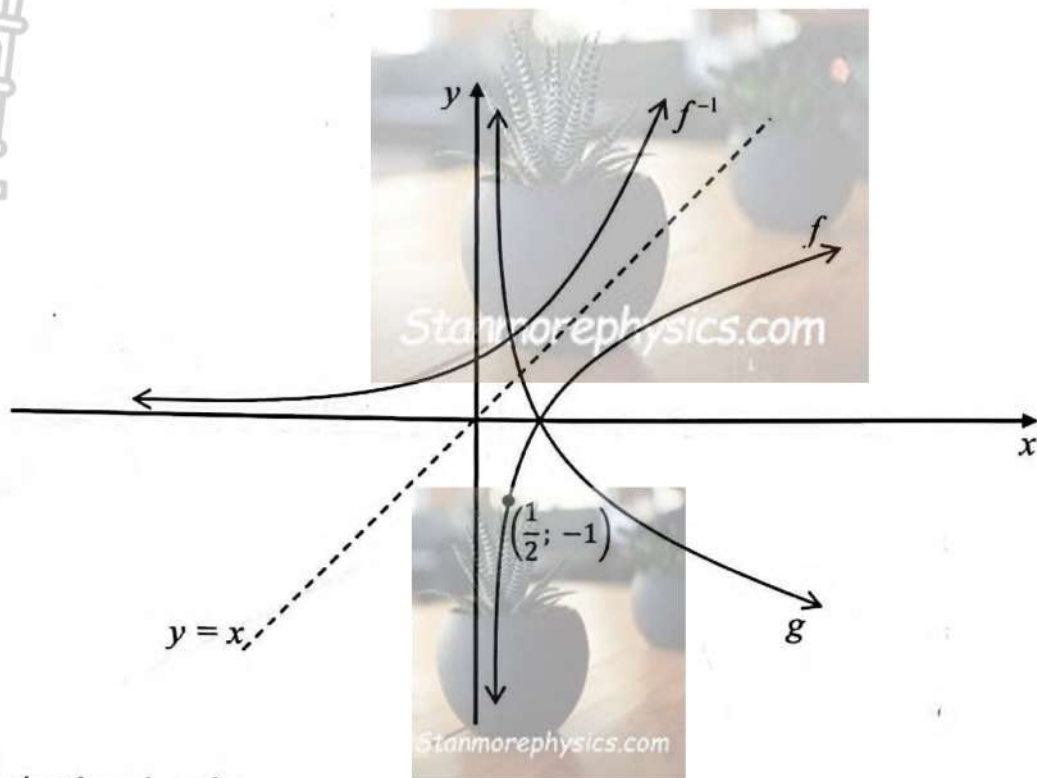
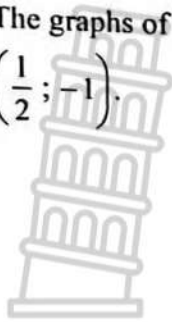
5.3 h , the graph of $y = -8x + k$, is a tangent to f at E. Determine the value of k . (4)

5.4 Determine the new equation of f , if the graph of f is moved 1 unit to the left. (2)

5.5 For which values of p will the equation $-2x^2 + 8x + 3 = p$, have non-real roots? (2)
[15]

QUESTION 6

The graphs of $y = f(x) = \log_a x$, f^{-1} and g are drawn below. f passes through the point $\left(\frac{1}{2}; -1\right)$.



- 6.1 Determine the value of a . (2)
- 6.2 Write down the equation of f^{-1} , in the form $y = \dots$ (2)
- 6.3 g is the reflection of f in the x -axis.
- 6.3.1 Write down the equation of g . (1)
- 6.3.2 Is g an increasing or decreasing function? (1)
- 6.4 For which values of x , is $f(x) < -1$? (2)
- [8]**

QUESTION 7

- 7.1 Tom deposits R5 000 into a savings account. The interest rate is 9% p.a. compounded monthly. How long, in years, will it take for the savings to double? (4)
- 7.2 Calculate the monthly nominal interest rate if an investment earns interest at 12,13% p.a., compounded annually. (3)
- 7.3 Kim made an initial deposit of R20 000 into an investment account that paid interest at the rate of 7,2% p.a., compounded quarterly. After 2 years the interest rate changed to 7,8% p.a., compounded monthly. Four years after her initial deposit, Kim withdrew R x from her investment. After 7 years the investment is worth R30 871,61.
- 7.3.1 Calculate how much Kim had in her investment account 2 years after the initial deposit was made. (2)
- 7.3.2 How much money did she withdraw? , i.e. determine the value of x (to the nearest rand). (5)
- [14]

QUESTION 8

- 8.1 Determine $f'(x)$, from first principles, if $f(x) = 5x^2 + 1$. (4)
- 8.2 Determine:
- 8.2.1 $\frac{dy}{dx}$, if $y = 2x^3 - \frac{x}{5}$ (2)
- 8.2.2 $D_x \left[\frac{\sqrt{x^5 + 5}}{x^2} \right]$ (4)
- 8.3 Given that $h(x) = 3x^2 + 4x$, determine the equation of the tangent to h at point $T(-1; y)$. (5)
- [15]

QUESTION 9

Given: $f(x) = x^3 - 3x^2 - 9x - 5$.

Answer the questions that follow.

- 9.1 Show that $(x + 1)$ is a factor of $f(x)$. (1)
- 9.2 Determine the x - and y -intercepts of f . (3)
- 9.3 Determine the coordinates of the turning points of f . (3)
- 9.4 Sketch the graph of f . Clearly indicate the coordinates of the turning points and the intercepts with the axes. (3)
- 9.5 For which values of x , is:
 - 9.5.1 f increasing? (2)
 - 9.5.2 f concaved up? (2)
 - 9.5.3 $f(x) \cdot f'(x) > 0$? (2)



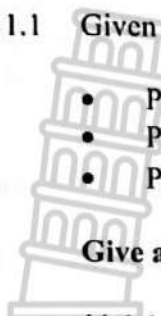
[16]

QUESTION 10

Given: $h(x) = -x^3 + bx^2 + cx$, with $P\left(-1; -\frac{7}{2}\right)$ a turning point of h . The graph of h passes through the origin. Determine the values of b and c . (Show ALL your working) [7]

QUESTION 11

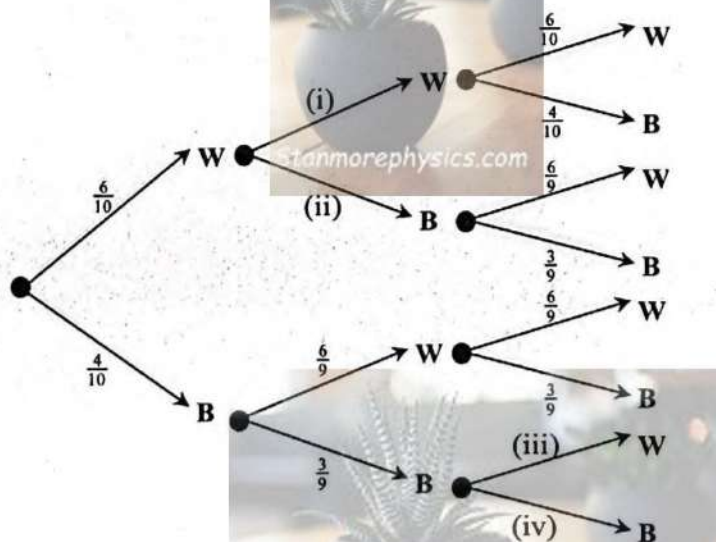
11.1 Given that:



- $P(A) = 0,63$
- $P(B) = 0,25$
- $P(A \text{ or } B)' = 0,2775$

Give answers correct to **FOUR** decimal places, where necessary.

- 11.1.1 Determine the probability that at least one of the events will take place. (1)
- 11.1.2 Are the events A and B mutually exclusive? Support your answer. (2)
- 11.1.3 Are the events A and B independent? Show your working to justify your conclusion. (2)
- 11.2 A bag contains 6 white balls and 4 blue balls. Three balls are taken consecutively out of the bag. Each time a white ball is found, it is put back in the bag. When a blue ball is found, it is placed aside. The tree diagram represents the process.



- 11.2.1 Fill in the missing probabilities on the branches, (i), (ii), (iii) and (iv) above. (2)
- 11.2.2 Determine the following probabilities:
- (a) Two blue balls are selected (2)
- (b) At least one of the balls selected is blue (2)

11.3 $P(A \text{ and } B)$; $P(B)$; $P(\text{only } A)$, in that order, forms an arithmetic sequence, with $P(A \text{ or } B)' = d$, the common difference.



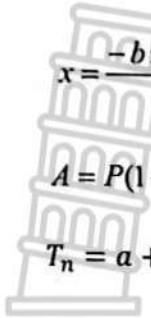
11.3.1 Represent the above information in a Venn diagram. (3)

11.3.2 Hence, or otherwise, determine $P(\text{only } A)$. (2)
[16]

TOTAL: 150



INFORMATION SHEET: MATHEMATICS



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

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

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

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

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

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

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

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

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

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

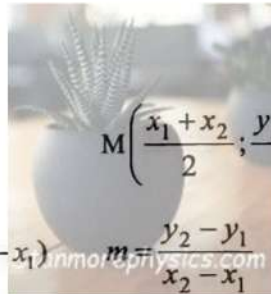
$$-1 < r < 1$$

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

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

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

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



$$y = mx + c$$

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

$$m = \tan \theta$$

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

In ΔABC :

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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



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GRADE/GRAAD 12

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

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MARKS/PUNTE: 150

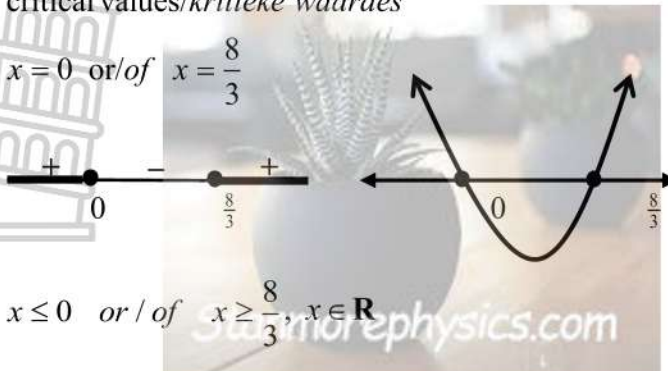
This marking guideline consists of 19 pages./
Hierdie nasienriglyn bestaan uit 19 bladsye.

NOTE/LET WEL:

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

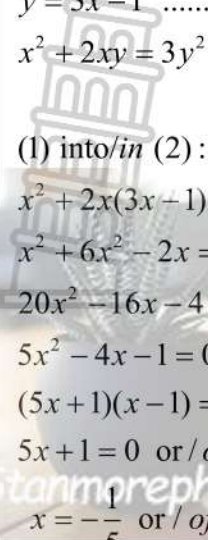

QUESTION/VRAAG 1

1.1.1	$x(x-3) + 2(x-3) = 0$ $(x-3)(x+2) = 0$ $x-3 = 0 \text{ or/of } x+2 = 0$ $x = 3 \text{ or/of } x = -2$	<div style="border: 1px solid black; padding: 5px; width: fit-content;"> Answers only – Full Marks <i>Slegs antwoorde – Volpunte</i> </div>	✓ factors / faktore ✓ both answers / beide antwoorde (2)
1.1.2	$3x^2 - 5x - 4 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(3)(-4)}}{2(3)}$ $x = \frac{5 \pm \sqrt{73}}{6}$ $\therefore x = -0,59 \text{ or/of } x = 2,26$	<div style="border: 1px solid black; padding: 5px; width: fit-content;"> Penalise 1 mark for incorrect rounding off./ <i>Penaliseer 1 punt vir verkeerde afronding.</i> </div>	✓ substitution / vervanging ✓✓ x-values / x-waardes (3)

<p>1.1.3</p>	$3x^2 - 8x \geq 0$ $x(3x - 8) \geq 0$ <p>critical values/kritieke waardes</p> $x = 0 \text{ or/of } x = \frac{8}{3}$  $x \leq 0 \text{ or/of } x \geq \frac{8}{3}, x \in \mathbf{R}$ <p style="text-align: center;">OR/OF</p> $x \in (-\infty; 0] \text{ or/of } x \in [\frac{8}{3}; \infty), x \in \mathbf{R}$	<p>✓ factors / faktore</p> <p>✓ critical values / kritieke waardes</p> <p>✓✓ $x \leq 0 \text{ or/of } x \geq \frac{8}{3}, x \in \mathbf{R}$ (accuracy / akkuraatheid)</p> <p style="text-align: center;">OR/OF</p> <p>$x \in (-\infty; 0] \text{ or/of } x \in [\frac{8}{3}; \infty), x \in \mathbf{R}$</p>
<p>1.1.4</p>	$\frac{3}{2x} = \sqrt{\frac{6}{x}} - 1$ $\frac{3}{2x} + 1 = \sqrt{\frac{6}{x}}$ $\left(\frac{3}{2x} + 1\right)^2 = \left(\sqrt{\frac{6}{x}}\right)^2$ $\frac{9}{4x^2} + \frac{3}{x} + 1 = \frac{6}{x}$ $9 + 12x + 4x^2 = 24x$ $4x^2 - 12x + 9 = 0$ $(2x - 3)(2x - 3) = 0$ $\therefore x = \frac{3}{2}$	<p>✓ isolating surd / isoleer wortelvorm</p> <p>✓ idea of squaring both sides / idee om albei kante te kwadreer</p> <p>✓ actual squaring / kwadrering</p> <p>✓ standard form / standaardvorm</p> <p>✓ answer / antwoord</p>

(4)

(5)

<p>1.2</p> $y = 3x - 1 \dots\dots\dots (1)$ $x^2 + 2xy = 3y^2 - 7 \dots\dots(2)$ <p>(1) into/in (2):</p> $x^2 + 2x(3x - 1) = 3(3x - 1)^2 - 7$ $x^2 + 6x^2 - 2x = 27x^2 - 18x + 3 - 7$ $20x^2 - 16x - 4 = 0$ $5x^2 - 4x - 1 = 0$ $(5x + 1)(x - 1) = 0$ $5x + 1 = 0 \text{ or / of } x - 1 = 0$ $x = -\frac{1}{5} \text{ or / of } x = 1$ $y = -\frac{8}{5} \text{ or / of } y = 2$		<p>✓ $y = 3x - 1$</p> <p>✓ substitution / <i>vervanging</i></p> <p>✓ expanding / <i>uitbreiding</i></p> <p>✓ standard form / <i>standaardvorm</i></p> <p>✓ x-values / <i>waardes</i></p> <p>✓ y-values / <i>waardes</i></p> <p>(6)</p>
<p>1.3</p> $x + y = 4$ $x^2 + 2xy + y^2 = 16$ $x^2 + y^2 = 14 \dots\dots\dots (1)$ $x^3 + y^3 = (x + y)(x^2 - xy + y^2)$ $= (4)(14 - 1)$ $= 52$ <p style="text-align: center;">OR / OF</p> $(x + y)^3 = (4)^3$ $(x + y)(x^2 + 2xy + y^2) = 64$ $x^3 + 3x^2y + 3xy^2 + y^3 = 64$ $x^3 + y^3 + 3xy(x + y) = 64$ $x^3 + y^3 + 3(1)(4) = 64$ $x^3 + y^3 = 52$		<p>✓ square both sides / <i>kwadreer beide kante</i></p> <p>✓ $x^2 + y^2 = 14$</p> <p>✓ sum of cubes factors / <i>som van derdemagte faktore</i></p> <p>✓ answer / <i>antwoord</i></p> <p>(4)</p> <p style="text-align: center;">OR / OF</p> <p>✓ cube both sides / <i>derdemag beide kante</i></p> <p>✓ expansion / <i>uitbreiding</i></p> <p>✓ grouping / <i>groepering</i></p> <p>✓ answer / <i>antwoord</i></p> <p>(4)</p> <p>[24]</p>

QUESTION/VRAAG 2

<p>2.1.1</p>	$\frac{p}{p+3} = \frac{p-2}{p}$ $p^2 = p^2 + p - 6$ $\therefore p = 6$	<ul style="list-style-type: none"> ✓ equating ratios / gelykstel van verhoudings ✓ simplification / vereenvoudiging ✓ answer / antwoord <p style="text-align: right;">(3)</p>
<p>2.1.2</p>	<p>9; 6; 4; ...</p> $r = \frac{2}{3}$ $\therefore -1 < \frac{2}{3} < 1$	<ul style="list-style-type: none"> ✓ value of r / waarde van r ✓ reason / rede <p style="text-align: right;">(2)</p>
<p>2.1.3</p>	$S_{\infty} = \frac{a}{1-r}$ $= \frac{9}{1-\frac{2}{3}}$ $= 27$	<ul style="list-style-type: none"> ✓ substitution / vervanging ✓ answer / antwoord <p style="text-align: right;">(2)</p>
<p>2.2.1</p>	$2 \cdot 3^{n-1} = 13122$ $3^{n-1} = 6561 = 3^8$ $\therefore n-1 = 8$ $n = 9$ $\therefore \sum_{n=1}^9 2 \cdot (3)^{n-1}$	<ul style="list-style-type: none"> ✓ equating / geslykstelling ✓ value of n / waarde van n ✓ answer / antwoord <p style="text-align: right;">(3)</p>
<p>2.2.2</p>	$S_n = \frac{a(r^n - 1)}{r - 1}$ $= \frac{2(3^9 - 1)}{3 - 1}$ $= 19682$	<ul style="list-style-type: none"> ✓ substitution / vervanging ✓ answer / antwoord <p style="text-align: right;">(2)</p>
		[12]

QUESTION/VRAAG 3

3.1.1	<p> 1 ; x ; y ; z ; T_5 3 ; 9 ; 15 ; 21 6 ; 6 ; 6 $T_2 = 4$ and / en $T_3 = 13$ </p>	<p>✓ 1st differences / 1^{ste} verskille</p> <p>✓ answer / antwoord</p> <p>(2)</p>
3.1.2	$2a = 6 \quad 3a + b = 3 \quad a + b + c = 1$ $a = 3 \quad 3(3) + b = 3 \quad 3 - 6 + c = 1$ $b = -6 \quad c = 4$ $\therefore T_n = 3n^2 - 6n + 4$	<p>✓ value of a / waarde van a</p> <p>✓ value of b / waarde van b</p> <p>✓ value of c / waarde van c</p> <p>(3)</p>
3.2	$12 - d ; 12 ; 12 + d$ <p>Applying Pythagoras :</p> $(12 + d)^2 = (12)^2 + (12 - d)^2$ $144 + 24d + d^2 = 144 + 144 - 24d + d^2$ $48d = 144$ $d = 3$ <p>\therefore short side = 9</p> <p>\therefore hypotenuse = 15</p>	<p>✓ sequence in terms of d / ry in terme van d</p> <p>✓ use of Pythagoras / gebruik van Pythagoras</p> <p>✓ value of d / waarde van d</p> <p>✓ answers / antwoorde</p> <p>(4)</p>

<p>3.3</p>	$\sum_{p=5}^{20} (p+1)^2 - \sum_{p=5}^{20} (p^2)$ $= (6^2 + 7^2 + \dots + 21^2) - (5^2 + 6^2 + \dots + 20^2)$ $= 21^2 - 5^2$ $= 416$ <p>OR / OF</p> $\sum_{p=5}^{20} (p+1)^2 - \sum_{p=5}^{20} (p^2)$ $= \sum_5^{20} (2p+1)$ $= 11 + 13 + 15 + \dots + 41$ $\therefore S_{16} = \frac{16}{2}(11+41)$ $= 416$ <p>OR / OF</p> $36 + 49 + 64 + \dots + 441$ $S_{16} = \frac{16}{2}(36 + 441) = 3816$ $25 + 36 + 49 + \dots + 400$ $S_{16} = \frac{16}{2}(25 + 400) = 3400$ $3816 - 3400$ $= 416$	<ul style="list-style-type: none"> ✓ expanding / uitbreiding ✓ expanding / uitbreiding ✓ simplification / vereenvoudiging ✓ answer / antwoord OR / OF ✓ combining Sigma notation kombineer Sigma notasie ✓ expanding / uitbreiding ✓ substitution / vervanging ✓ answer / antwoord OR / OF ✓ expanding / uitbreiding ✓ both sums / beide somme ✓ answer / antwoord <p style="text-align: right;">(4) [13]</p>
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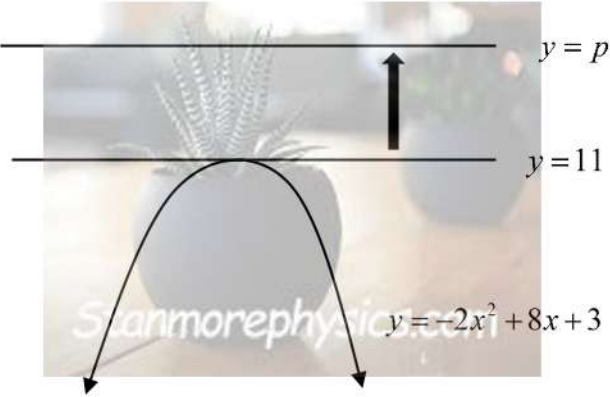
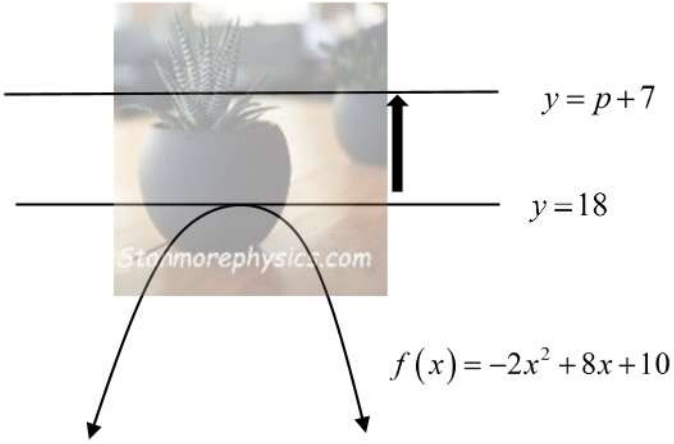
QUESTION/VRAAG 4

4.1	$x \neq 4; x \in \mathbb{R}$	✓ answer / antwoord (1)
4.2	$y = 3$	✓ answer / antwoord (1)
4.3	$f(0) = \frac{6}{0-4} + 3$ $= \frac{3}{2}$ $\frac{6}{x-4} + 3 = 0$ $6 = -3x + 12$ $3x = 6$ $x = 2$	✓ answer / antwoord ✓ $y = 0$ ✓ answer / antwoord (3)
4.4		✓ x- & y-intercepts <i>x- & y-afsnitte</i> ✓ asymptotes / <i>asimptote</i> ✓ shape / <i>vorm</i> (3)
4.5	$2 \leq x < 4$	✓✓ answer / antwoord (2)
		[10]

QUESTION/VRAAG 5

<p>5.1.1</p>	$x = \frac{-b}{2a}$ $= \frac{-8}{2(-2)}$ $= 2$ $y = -2(2)^2 + 8(2) + 10$ $= 18$ <p>A(2 ; 18)</p>	<p>✓ x-value / x-waarde</p> <p>✓ y-value / y-waarde</p> <p>(2)</p>
<p>5.1.2</p>	$-2x^2 + 8x + 10 = 0$ $(-2x + 10)(x + 1) = 0$ <p>x = 5 or / of x = -1</p> <p>∴ BC = 6 units / eenhede</p>	<p>✓ equating to 0 / gelyk stel aan 0</p> <p>✓ x-intercepts / x-afsnitte</p> <p>✓ answer / antwoord</p> <p>(3)</p>
<p>5.2</p>	$m_g = \frac{-14 - 0}{6 + 1} = -2$ <p>y - 0 = -2(x + 1) OR/OF</p> $y = -2x - 2$	$m = \frac{-14 - 0}{6 + 1} = -2$ <p>✓ gradient / gradiënt</p> $y = -2x + c$ $0 = 2(-1) + c$ $c = -2$ <p>∴ y = -2x - 2</p> <p>✓ equation / vergelyking</p> <p>(2)</p>

<p>5.3</p>	$f'(x) = -4x + 8 = -8$ $-4x = -16$ $x = 4$ $y = -2(4)^2 + 8(4) + 10$ $= 10$ $y = -8x + k$ $10 = -8(4) + k$ $k = 42$ <p>OR/OF</p> $-2x^2 + 8x + 10 = -8x + k$ $-2x^2 + 16x + 10 - k = 0$ <p>tangent with one real root: / raaklyn met een reële wortel (equal roots) / (gelyke wortels)</p> $b^2 - 4ac = 0$ $(16)^2 - 4(-2)(10 - k) = 0$ $256 + 8(10 - k) = 0$ $256 + 80 - 8k = 0$ $-8k = -336$ $k = 42$ $\therefore h(x) = -8x + 42$	<p>✓ equating f' to -8 / stel f' gelyk aan -8</p> <p>✓ $x = 4$ and/en $y = 10$</p> <p>✓ substituting point / vervanging van punt ✓ answer / antwoord</p> <p>OR/OF</p> <p>✓ equating f to h / stel f gelyk aan h</p> <p>✓ standard form / standaardvorm</p> <p>✓ substitution into delta / vervanging in delta</p> <p>✓ answer / antwoord</p> <p style="text-align: right;">(4)</p>
<p>5.4</p>	$f(x) = -2(x+1)^2 + 8(x+1) + 10$ $= -2x^2 - 4x - 2 + 8x + 8 + 10$ $= -2x^2 + 4x + 16$ <p>OR/OF</p> <p>$A(2;18)$ and/en $a = -2$</p> $f(x) = -2(x-2)^2 + 18$ $f(x+1) = -2(x+1-2)^2 + 18$ $= -2(x-1)^2 + 18$	<p>✓ replace x with $(x+1)$ vervang x met $(x+1)$</p> <p>✓ answer / antwoord</p> <p>OR/OF</p> <p>✓ replace x with $(x+1)$ vervang x met $(x+1)$</p> <p>✓ answer / antwoord</p> <p style="text-align: right;">(2)</p>

5.5	$p > 11$	✓✓ answer / antwoord (2)
<p>Few approaches for teaching and learning / Paar benaderings vir onderrig en leer</p>		
<p>Option 1 / Opsie 1</p>		
$x = \frac{8}{2(-2)} = 2$ $y = -(2)^2 + 8(2) + 3$ $= 11$ <p>T.P(2;11)</p> <p>$\therefore p > 11$</p>		
<p>Option 2 / Opsie 2</p>		
$-2x^2 + 8x + 3 = p$ $-2x + 8x + 10 = p + 7$ <p>For non-real :</p> $p + 7 > 18$ <p>$\therefore p > 11$</p>		
<p>Option 3 / Opsie 3</p>		
$-2x^2 + 8x + 3 - p = 0$ <p>For non-real: / Vir nie - reël:</p> $b^2 - 4ac < 0$ $(8)^2 - 4(-2)(3 - p) < 0$ $64 + 24 - 8p < 0$ $-8p < -88$ <p>$\therefore p > 11$</p>		
		[15]

QUESTION/VRAAG 6

6.1	$y = \log_a x$ $-1 = \log_a \left(\frac{1}{2} \right)$ $\frac{1}{a} = \frac{1}{2}$ $\therefore a = 2$	✓ substitution / <i>vervang</i> ✓ answer / <i>antwoord</i>	(2)
6.2	$f: y = \log_2 x$ $f^{-1}: x = \log_2 y$ $\therefore y = 2^x$	✓ swapping x and y / <i>omruil van x en y</i> ✓ answer / <i>antwoord</i>	(2)
6.3.1	$g(x) = -\log_2 x$ OR/OF $g(x) = \log_{\frac{1}{2}} x$	✓ answer / <i>antwoord</i>	(1)
6.3.2	decreasing / <i>dalend</i>	✓ answer / <i>antwoord</i>	(1)
6.4	$0 < x < \frac{1}{2}$	✓✓ answer / <i>antwoord</i>	(2)
			[8]

QUESTION/VRAAG 7

<p>7.1</p>	$A = P(1+i)^{12n}$ $10\,000 = 5\,000 \left(1 + \frac{9\%}{12}\right)^{12n}$ $2 = (1,0075)^{12n}$ $\therefore 12n = \log_{1,0075}(2)$ $12n = 92,76 \text{ months / maande}$ $n = 7,73 \text{ years / jare}$	<ul style="list-style-type: none"> ✓ substitution / <i>vervanging</i> ✓ simplification / <i>vereenvoudiging</i> ✓ use of logs / <i>gebruik van logs</i> ✓ answer / <i>antwoord</i> <p style="text-align: right;">(4)</p>
<p>7.2</p>	$1 + i_{\text{eff}} = \left(1 + \frac{i_{\text{nom}}}{m}\right)^m$ $1 + 12,13\% = \left(1 + \frac{i_{\text{nom}}}{12}\right)^{12}$ $\sqrt[12]{(1 + 12,13\%)} = 1 + \frac{i_{\text{nom}}}{12}$ $\therefore i_{\text{nom}} = 12 \left(\sqrt[12]{(1 + 12,13\%)} - 1\right)$ $= 0,11503662039$ <p>⇒ nominal rate = 11,50 p.a compounded monthly <i>nominale koers = 11,50 p.j maandeliks saamgestel</i></p>	<ul style="list-style-type: none"> ✓ substitution / <i>vervanging</i> ✓ subject of the formula / <i>onderwerp van die formule</i> ✓ answer / <i>antwoord</i> <p style="text-align: right;">(3)</p>
<p>7.3.1</p>	$A = P(1+i)^n$ $= 20\,000 \left(1 + \frac{7,2\%}{4}\right)^8$ $= R\,23068,12$	<ul style="list-style-type: none"> ✓ substitution / <i>vervanging</i> ✓ answer / <i>antwoord</i> <p style="text-align: right;">(2)</p>
<p>7.3.2</p>	$A = \left[23\,068,12 \left(1 + \frac{7,8\%}{12}\right)^{24} - x \right] \left(1 + \frac{7,8\%}{12}\right)^{36}$ $30\,871,61 = 23\,068,12 \left(1 + \frac{7,8\%}{12}\right)^{60} - x \left(1 + \frac{7,8\%}{12}\right)^{36}$ $x \left(1 + \frac{7,8\%}{12}\right)^{36} = 23\,068,12 \left(1 + \frac{7,8\%}{12}\right)^{60} - 30\,871,61$ $x = \frac{23\,068,12 \left(1 + \frac{7,8\%}{12}\right)^{60} - 30\,871,61}{\left(1 + \frac{7,8\%}{12}\right)^{36}}$ $x = R\,2\,500,00$	<ul style="list-style-type: none"> ✓ $23\,068,12 \left(1 + \frac{7,8\%}{12}\right)^{24}$ ✓ multiply by $\left(1 + \frac{7,8\%}{12}\right)^{36}$ ✓ expanding / <i>uitbreiding</i> ✓ x subject of the formula / <i>x onderwerp van die formule</i> ✓ answer / <i>antwoord</i> <p style="text-align: right;">(5)</p>
		<p>[14]</p>

QUESTION/VRAAG 8

Penalise 1 mark for incorrect notation in 8.1 only
 Penaliseer 1 punt vir verkeerde notasie, slegs in 8.1

8.1

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

$$= \lim_{h \rightarrow 0} \frac{5(x+h)^2 + 1 - (5x^2 + 1)}{h}$$

$$= \lim_{h \rightarrow 0} \frac{5x^2 + 10xh + 5h^2 + 1 - 5x^2 - 1}{h}$$

$$= \lim_{h \rightarrow 0} \frac{10xh + 5h^2}{h}$$

$$= \lim_{h \rightarrow 0} \frac{h(10x + 5h)}{h}$$

$$= \lim_{h \rightarrow 0} (10x + 5h)$$

$$= 10x$$

Answer ONLY: 0 marks
 SLEGS antwoord: 0 punte

✓ substitution / vervanging

✓ simplification / vereenvoudiging

✓ factorisation / faktorisering
 (dividing by h / deel deur h)

✓ answer / antwoord

(4)

8.2.1

$$\frac{dy}{dx} = 6x^2 - \frac{1}{5}$$

✓ $6x^2$

✓ $\frac{1}{5}$

(2)

8.2.2

$$D_x \left[\frac{\sqrt{x^5 + 5}}{x^2} \right]$$

$$= D_x \left[\frac{x^{\frac{5}{2}}}{x^2} + \frac{5}{x^2} \right]$$

$$= D_x \left[x^{\frac{1}{2}} + 5x^{-2} \right]$$

$$= \frac{1}{2}x^{-\frac{1}{2}} - 10x^{-3}$$

✓ $x^{\frac{1}{2}}$

✓ $5x^{-2}$

✓ $\frac{1}{2}x^{-\frac{1}{2}}$

✓ $-10x^{-3}$

(4)

8.3

$$h(-1) = 3(-1)^2 + 4(-1)$$

$$= -1$$

$$T(-1; -1)$$

$$m = f'(x) = 6(-1) + 4 = -2$$

$$y + 1 = -2(x + 1)$$

$$y = -2x - 3$$

✓ coordinates of T / koördinate van T

✓ derivative = $6x + 4$ /
 afgeleide = $6x + 4$

✓ $m = -2$

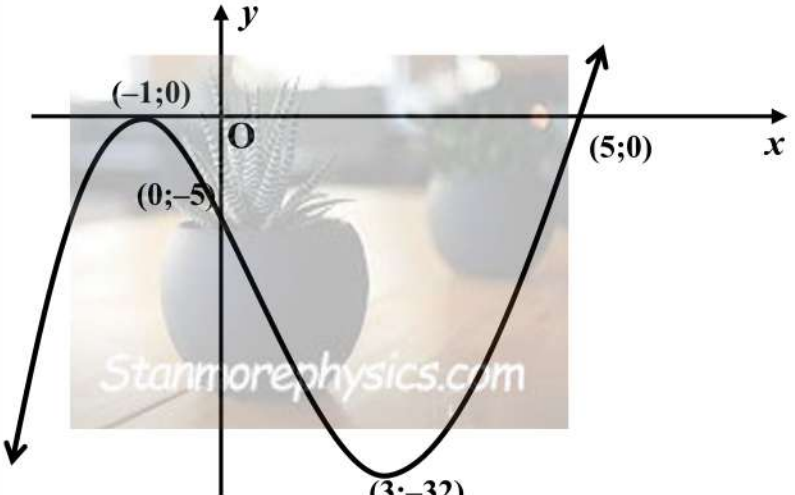
✓ substitution of $m = -2$ # point(-1; -1)

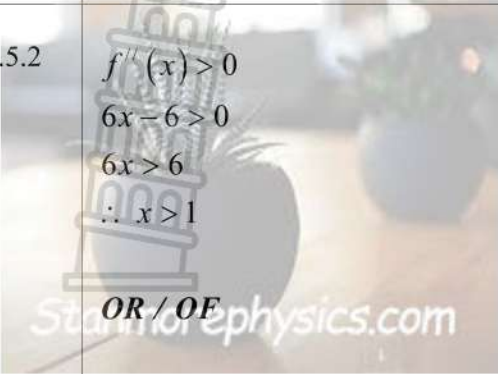
✓ answer / antwoord

(5)

[15]

QUESTION/VRAAG 9

<p>9.1</p>	$f(x) = x^3 - 3x^2 - 9x - 5$ $f(-1) = (-1)^3 - 3(-1)^2 - 9(-1) - 5$ $= -1 - 3 + 9 - 5$ $= 0$ <p>$\therefore (x + 1)$ is a factor. / is 'n faktor</p>	<p>✓ substitution of -1 and getting to 0 / vervanging van -1 en kry gelyk aan 0</p> <p>(1)</p>
<p>9.2</p>	<p>y-int: (let $x = 0$) $\Rightarrow y = -5$</p> <p>x-ints: (let $y = 0$):</p> $f(x) = x^3 - 3x^2 - 9x - 5 = 0$ $(x + 1)(x^2 - 4x - 5) = 0$ $(x + 1)(x + 1)(x - 5) = 0$ <p>$\therefore x = -1$ or / of $x = -1$ or / of $x = 5$</p>	<p>✓ y-intercept / y-afsnit</p> <p>✓ quadratic bracket / kwadratiese hakkie</p> <p>✓ x-intercepts / x-afsnitte</p> <p>(3)</p>
<p>9.3</p>	$f(x) = x^3 - 3x^2 - 9x - 5$ $f'(x) = 3x^2 - 6x - 9 = 0$ $x^2 - 2x - 3 = 0$ $(x + 1)(x - 3) = 0$ <p>$x = -1$ or / of $x = 3$</p> <p>$y = 0$ or / of $y = -32$</p> <p>$P(-1; 0)$; $Q(3; -32)$</p>	<p>✓ $f'(x) = 0$</p> <p>✓ x-values / x-waardes</p> <p>✓ y-values / y-waardes</p> <p>(3)</p>
<p>9.4</p>		<p>✓ x- and y- intercepts x- en y- afsnitte</p> <p>✓ turning points / draaipunte</p> <p>✓ shape / vorm</p> <p>(3)</p>

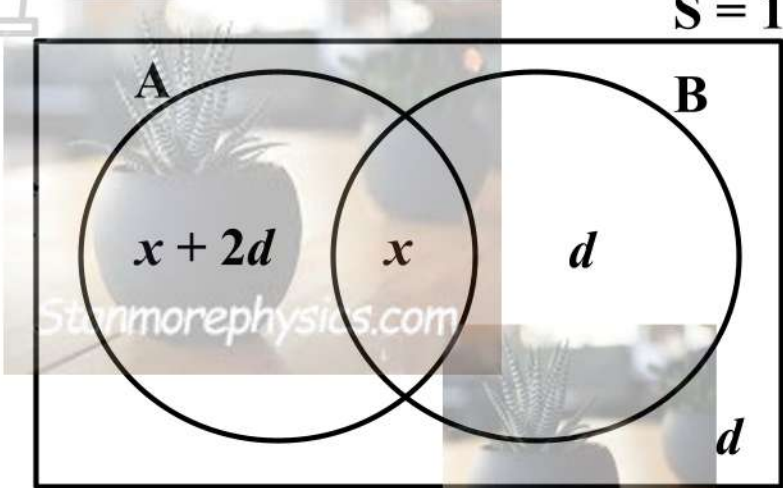
9.5.1	$x < -1$ or / of $x > 3$ Accept/Aanvaar: $x \leq -1$ or / of $x \geq 3$	✓✓ answer / antwoord (2)
9.5.2	 $f''(x) > 0$ $6x - 6 > 0$ $6x > 6$ $\therefore x > 1$ <p>OR / OF</p> $x = \frac{-1+3}{2} = 1$ $\therefore x > 1$ <p>OR / OF</p> $x > 1$ (answer only / slegs antwoord)	✓ method / metode ✓ answer / antwoord OR / OF ✓ method / metode ✓ answer / antwoord OR / OF ✓✓ answer / antwoord (2)
9.5.3	$-1 < x < 3$ or / of $x > 5$	✓✓ answer / antwoord (2)
		[16]

QUESTION/VRAAG 10

<p>10.</p>	<p>$d = 0$ (h passes through origin / <i>h gaan deur oorsprong</i>) $\therefore h(x) = -x^3 + bx^2 + cx$ $-\frac{7}{2} = -(-1)^3 + b(-1)^2 + c(-1)$ $-9 = 2b - 2c \dots\dots\dots(1)$ $h'(x) = -3x^2 + 2bx + c$ $h'(-1) = -3(-1)^2 + 2b(-1) + c = 0$ $3 = -2b + c \dots\dots\dots(2)$ $(1) + (2): -c = -6 \Rightarrow c = 6$ $3 = -2b + 6$ $\therefore b = \frac{3}{2}$</p>	<p>✓ substitution into $h(x)$/vervanging in $h(x)$ ✓ equation 1 / <i>vergelyking 1</i> ✓ $h'(x)$ ✓ substitution and equating to 0 / <i>vervanging en gelykstel aan 0</i> ✓ equation 2 / <i>vergelyking 2</i> ✓ value of c / <i>waarde van c</i> ✓ value of b / <i>waarde van b</i></p>
		<p>[7]</p>

QUESTION/VRAAG 11

11.1.1	$P(A \text{ or / of } B) = 1 - P(A \text{ or / of } B)^c$ $= 1 - 0,2775$ $= 0,7225$	✓ answer / antwoord (1)
11.1.2	$P(A \text{ or / of } B) = 0,7225$ $P(A) + P(B) = 0,63 + 0,25 = 0,88$ $\therefore P(A \text{ or / of } B) \neq P(A) + P(B)$ $\Rightarrow \text{not mutually exclusive / nie onderling uitsluitend}$ <p>OR/OF</p> $P(A \text{ and / en } B) = P(A) + P(B) - P(A \text{ or / of } B)$ $= 0,63 + 0,25 - 0,7225$ $= 0,1575$ $\therefore P(A \text{ and / en } B) \neq 0$ $\Rightarrow \text{not mutually exclusive / nie onderling uitsluitend}$	✓ calculation to support answer <i>berekening om antwoord te staaf</i> ✓ answer / antwoord <p>OR/OF</p> ✓ calculation to support answer <i>berekening om antwoord te staaf</i> ✓ answer / antwoord (2)
11.1.3	$P(A) \times P(B) = 0,63 \times 0,25 = 0,1575$ $P(A \text{ and / en } B) = 0,1575 \quad (\text{from / vanaf } 11.1.2)$ $\therefore P(A \text{ and / en } B) = P(A) \times P(B)$ $\Rightarrow \text{events are independent / gebeurtenisse is onafhanklik}$	✓ calculation to support answer/ <i>berekening om antwoord te staaf</i> ✓ answer / antwoord (2)
11.2.1	$(i) = \frac{6}{10} \text{ and / en } (ii) = \frac{4}{10}$ $(iii) = \frac{6}{8} \text{ and / en } (iv) = \frac{2}{8}$	✓ $\frac{6}{10}$ and / en $\frac{4}{10}$ ✓ $\frac{6}{8}$ and / en $\frac{2}{8}$ (2)
11.2.2 (a)	$\left(\frac{6}{10} \times \frac{4}{10} \times \frac{3}{9}\right) + \left(\frac{4}{10} \times \frac{6}{9} \times \frac{3}{9}\right)$ $= \frac{2}{25} + \frac{4}{45}$ $= 0,08 + 0,08$ $= 0,17$	✓ adding of branches <i>optel van takke</i> ✓ answer / antwoord (2)

<p>11.2.2 (b)</p>	$P(\text{atleastoneblue}) = 1 - P(\text{allwhite})$ $P(\text{tenminsteeenblou}) = 1 - P(\text{almalwit})$ $= 1 - \left(\frac{6}{10} \times \frac{6}{10} \times \frac{6}{10}\right)$ $= 0,784$	<p>✓ using rule / gebruik van reël</p> <p>✓ answer / antwoord (2)</p>
<p>11.3.1</p>	 <p>A Venn diagram showing two overlapping circles, A and B, within a rectangular universal set S = 1. Circle A is on the left and contains the expression $x + 2d$. Circle B is on the right and contains the expression d. The intersection of circles A and B contains the expression x. The labels A, B, and S = 1 are placed near their respective elements.</p>	<p>✓ $P(A \text{ or/of } B)' = d$ and/en $P(A \text{ and/en } B) = x$</p> <p>✓ $P(\text{only/slegs } A) = x + 2d$</p> <p>✓ $P(B) = d$</p> <p>(3)</p>
<p>11.3.2</p>	$x + 2d + x + d + d = 1$ $2x + 4d = 1$ $x + 2d = \frac{1}{2}$ $P(\text{only / slegs } A) = \frac{1}{2} / 0,5$	<p>✓ equation / vergelyking</p> <p>✓ answer / antwoord (2)</p>
<p>[16]</p>		
<p>TOTAL/TOTAAL: 150</p>		