



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE/GRAAD 12

MATHEMATICS P1/WISKUNDE VI

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MEMORANDUM

MARKS: 150

PUNTE: 150

**This memorandum consists of 22 pages.
*Hierdie memorandum bestaan uit 22 bladsye.***

NOTE:

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

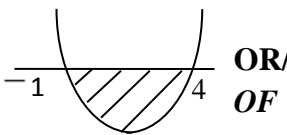
LET WEL:

- Indien 'n kandidaat 'n vraag TWEE keer beantwoord, merk slegs die EERSTE poging.
- Volgehoue akkuraatheid is DEURGAANS op ALLE aspekte van die memorandum van toepassing.

QUESTION/VRAAG 1

1.1.1	$(x-2)(4+x) = 0$ $x = 2$ or $x = -4$	$\checkmark x = 2$ $\checkmark x = -4$ (2)
1.1.2	$3x^2 - 2x - 14 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{2 \pm \sqrt{(-2)^2 - 4(3)(-14)}}{2(3)}$ $= \frac{2 \pm \sqrt{172}}{6}$ $x = 2,52$ or/of $x = -1,85$ OR/OF $x^2 - \frac{2}{3}x + \frac{1}{9} = \frac{14}{3} + \frac{1}{9}$ $\left(x - \frac{1}{3}\right)^2 = \frac{43}{9}$ $x - \frac{1}{3} = \pm \frac{\sqrt{43}}{3}$ $\therefore x = \frac{1 \pm \sqrt{43}}{3}$ $x = 2,52$ or/of $x = -1,85$	\checkmark standard form/standaardvorm \checkmark substitution into correct formula/substitusie in korrekte formule $\checkmark\checkmark$ answers/antwoorde (4) \checkmark for adding $\frac{1}{9}$ on both sides/tel $\frac{1}{9}$ by aan beide kante $\checkmark x = \frac{1 \pm \sqrt{43}}{3}$ $\checkmark\checkmark$ answers (4)

<p>1.1.3</p>	$2^{x+2} + 2^x = 20$ $2^x(2^2 + 1) = 20$ $2^x = \frac{20}{5}$ $2^x = 2^2$ $\therefore x = 2$ <p>OR/OF</p> $2^x \cdot 2^2 + 2^x = 2^2 \cdot 5$ $2^x(2^2 + 1) = 2^2 \cdot 5$ $2^x \cdot 5 = 2^2 \cdot 5$ $\therefore x = 2$ <p>OR/OF</p> $4 \cdot 2^x + 2^x = 20$ $5 \cdot 2^x = 20$ $2^x = 4 = 2^2$ $\therefore x = 2$	<p>✓ common factor/<i>gemeen. faktor</i> ✓ simplification/<i>vereenvoudiging</i></p> <p>✓ answer/<i>antwoord</i> (3)</p> <p>✓ common factor/<i>gemeen. faktor</i> ✓ simplification/<i>vereenvoudiging</i> ✓ answer/<i>antwoord</i> (3)</p> <p>✓ $5 \cdot 2^x = 20$ ✓ $2^x = 4$ ✓ answer/<i>antwoord</i> (3)</p>
<p>1.2</p>	$x = 2y + 3 \quad \dots\dots\dots(1)$ $3x^2 - 5xy = 24 + 16y \quad \dots\dots\dots(2)$ <p>(1) in (2):</p> $3(2y + 3)^2 - 5(2y + 3)y = 24 + 16y$ $3(4y^2 + 12y + 9) - 10y^2 - 15y = 24 + 16y$ $12y^2 + 36y + 27 - 10y^2 - 15y - 24 - 16y = 0$ $2y^2 + 5y + 3 = 0$ $(2y + 3)(y + 1) = 0$ $y = -\frac{3}{2} \quad \text{or} \quad y = -1$ $\therefore x = 2\left(-\frac{3}{2}\right) + 3 \quad \text{or} \quad x = 2(-1) + 3$ $x = 0 \quad \text{or} \quad x = 1$ $(0; -\frac{3}{2}) \quad (1; -1)$ <p>OR/OF</p>	<p>✓ substitution/<i>substitusie</i></p> <p>✓ simplification/<i>vereenvoudiging</i> ✓ standard form/<i>standaardvorm</i> ✓ factorisation/<i>faktorisering</i> ✓ y-values/<i>y-waardes</i></p> <p>✓ x-values/<i>x-waardes</i> (6)</p>

	$y = \frac{x-3}{2}$ $3x^2 - 5x\left(\frac{x-3}{2}\right) = 24 + 16\left(\frac{x-3}{2}\right)$ $3x^2 - \frac{5x^2 - 15x}{2} = 24 + \frac{16x - 48}{2}$ $\times 2: 6x^2 - 5x^2 + 15x = 48 + 16x - 48$ $x^2 - x = 0$ $x(x-1) = 0$ $x = 0 \text{ or } x = 1$ $y = -\frac{3}{2} \text{ or } y = -1$	<p>✓ substitution/<i>substitusie</i></p> <p>✓ simplification/<i>vereenvoudiging</i></p> <p>✓ standard form / <i>standard vorm</i></p> <p>✓ factors/<i>faktore</i></p> <p>✓ x- values/x- waardes</p> <p>✓ y-values/y-waardes</p> <p>(6)</p>
<p>1.3</p>	$(x-1)(x-2) < 6$ $x^2 - 3x + 2 < 6$ $x^2 - 3x - 4 < 0$ $(x+1)(x-4) < 0$  $-1 < x < 4 \text{ or } x \in (-1; 4)$	<p>✓ standard form/<i>standaardvorm</i></p> <p>✓ factorisation/<i>faktorisering</i></p> <p>✓ critical values in the context of inequality / <i>kritiese waardes in die konteks van die ongelykheid</i></p> <p>✓ notation/<i>notasie</i></p> <p>(4)</p>
<p>1.4</p>	$-k - 4 \geq 0$ $k \leq -4$	<p>✓ $-k - 4 \geq 0$</p> <p>✓ answer/<i>antwoord</i></p> <p>(2)</p> <p>[21]</p>

QUESTION/VRAAG 2

2.1	$T_4 = 23$	✓23 (1)
2.2	$T_{251} = a + (n-1)d$ $= 2 + (251-1)(7)$ $= 1752$	✓ $a = 2$ and $d = 7$ ✓subst. into correct formula / <i>subst. in korrekte formule</i> ✓1752 (3)
2.3	$\sum_{n=1}^{251} (7n-5)$ OR/OF $\sum_{p=0}^{250} (7p+2)$	✓ general term/ <i>algemene term</i> ✓ complete answer / <i>volledige antwoord</i> (2) ✓ general term/ <i>algemene term</i> ✓ complete answer / <i>volledige antwoord</i> (2)
2.4	$S_n = \frac{n}{2}[a+l]$ $S_n = \frac{251}{2}[2+1752]$ $= 220127$ OR/OF $S_n = \frac{n}{2}[2a + (n-1)d]$ $= \frac{251}{2}[2(2) + (251-1)(7)]$ $= 220127$	✓ substitution/ <i>substitusie</i> ✓220127 (2) ✓ substitution/ <i>substitusie</i> ✓220127 (2)
2.5	The new series/ <i>Die nuwe reeks</i> is $16 + 44 + 72 + \dots + 1752$ $16 + 28(n-1) = 1752$ $1736 = 28(n-1)$ $62 = n-1$ $n = 63$ OR/OF $2 + 9 + \underline{16} + 23 + 30 + 37 + \underline{44} + 51 + \dots + \underline{1752}$ T_3 is divisible by / <i>is deelbaar deur 4</i> Then $T_7, T_{11}, T_{15}, \dots, T_{251}$ are divisible by 4, thus each 4 th term is divisible by 4. Daarna is $T_7, T_{11}, T_{15}, \dots, T_{251}$ deelbaar deur 4, d.w.s. elke 4 ^{de} term is deelbaar deur 4. ∴ number of terms divisible by 4 will be $= \frac{251-3}{4} + 1 = 63$ ∴ aantal terme deelbaar deur 4 sal wees $= \frac{251-3}{4} + 1 = 63$ OR/OF	✓✓ generating new series divisible by 4/ <i>vorming van nuwe reeks deelbaar deur 4</i> ✓ $T_n = 1752$ ✓ 63 (4) ✓ T_3 is divisible by 4/ <i>is deelbaar deur 4</i> ✓ identifying terms divisible by 4/ <i>identifiseer terme deelbaar deur 4</i> ✓ reasoning/ <i>redenering</i> ✓63 (4)

	<p>Position of terms divisible by 4: 3 ; 7 ; 11 ; ... ; 247; 251 $T_n = 4n - 1 = 251$ $4n = 252$ $n = 63$</p>	<p>✓✓ generating sequence involving position of terms/<i>vorming van reeks</i> <i>i.t.v. posisie van terme</i> ✓ $T_n = 251$ ✓ 63 (4)</p> <p>[12]</p>
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QUESTION/VRAAG 3

<p>3.1.1</p>	$ \begin{array}{ccc} -1 & ; & -7 & ; & -11 & ; & p & ; & \dots \\ & \swarrow & & \swarrow & & \swarrow & & & \\ & -6 & & -4 & & p+11 & & & \\ & & \swarrow & & \swarrow & & & & \\ & & 2 & & 2 & & & & \\ p+11 - (-4) & = & 2 \\ p+15 & = & 2 \\ p & = & -13 \end{array} $ <p>OR/OF</p> $ \begin{array}{ccc} -1 & ; & -7 & ; & -11 & ; & p & ; & \dots \\ & \swarrow & & \swarrow & & \swarrow & & & \\ & -6 & & -4 & & p+11 & & & \\ & & \swarrow & & \swarrow & & & & \\ & & 2 & & 2 & & & & \\ p+11 & = & -2 \\ p & = & -13 \end{array} $	<p>✓ $p + 15 = 2$ ✓ $p = -13$ (2)</p> <p>✓ first differences/ <i>eerste verskille</i></p> <p>✓ $p = -13$ (2)</p>
<p>3.1.2</p>	$ \begin{array}{l} 2a = 2 \\ a = 1 \\ \\ 3a + b = -6 \\ 3(1) + b = -6 \\ b = -9 \\ \\ a + b + c = -1 \\ 1 - 9 + c = -1 \\ c = 7 \\ T_n = n^2 - 9n + 7 \\ \\ \mathbf{OR/OF} \\ T_n = T_1 + (n-1)d_1 + \frac{(n-1)(n-2)d_2}{2} \\ = -1 + (n-1)(-6) + \frac{(n-1)(n-2)(2)}{2} \\ = -1 - 6n + 6 + \frac{2n^2 - 6n + 4}{2} \\ = n^2 - 9n + 7 \end{array} $	<p>✓ $a = 1$</p> <p>✓ $b = -9$</p> <p>✓ $c = 7$</p> <p>✓ answer/antwoord (4)</p> <p>✓ formula/formule</p> <p>✓ substitution of first and second differences/ <i>substitusie van eerste en tweede verskille</i></p> <p>✓ simplification/vereenvoudiging</p> <p>✓ answer/antwoord (4)</p>

	<p>OR/OF</p> $ \begin{array}{ccccccc} 7; -1 & ; & -7 & ; & -11 & ; & p & ; & \dots \\ & & \swarrow & & \swarrow & & \swarrow & & \swarrow \\ & & -8 & & -6 & & -4 & & p+11 \\ & & & & \swarrow & & \swarrow & & \swarrow \\ & & & & 2 & & 2 & & 2 \end{array} $ <p> $T_0 = 7 = c$ $2a = 2 \quad \therefore a = 1$ $3a + b = -6 \quad \therefore b = -9$ $T_n = n^2 - 9n + 7$ </p> <p>OR/OF</p> <p> $a = \frac{1}{2}(2) = 1$ $\therefore T_n = n^2 + bn + c$ $T_1 = -1 \quad \therefore 1 + b + c = -1 \quad \dots\dots(1)$ $T_2 = -7 \quad \therefore 4 + 2b + c = -7 \quad \dots\dots(2)$ $(2) - (1): \quad 3 + b = -6$ $\therefore b = -9$ sub in (1): $c = 7$ $\therefore T_n = n^2 - 9n + 7$ </p>	<p> \checkmark c-value/c-waarde \checkmark a-value/a-waarde \checkmark b-value/b-waarde \checkmark answer/antwoord (4) </p> <p> \checkmark a-value/a-waarde \checkmark b-value/b-waarde \checkmark c-value/c-waarde \checkmark answer/antwoord (4) </p>
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<p>3.1.3</p>	<p>The sequence of first differences is/<i>Die reeks van eerste verskille is:</i> $- 6 ; - 4 ; - 2 ; 0 ; \dots$</p> <p>$- 6 + (n - 1)(2) = 96$ $n = 52$</p> <p>\therefore two terms are/<i> twee terme is:</i> $T_{52} = 52^2 - 9(52) + 7 = 2243$ $T_{53} = 53^2 - 9(53) + 7 = 2339$</p> <p>OR/OF</p> <p>The sequence of first differences is/<i>Die reeks van eerste verskille is:</i> $- 6 ; - 4 ; - 2 ; 0 ; \dots$</p> <p>The formula for the sequence of first differences/<i>Die formule vir die reeks van eerste verskille is</i> $T_n = 2n - 8$</p> <p>1st difference/<i>1^{ste} verskil:</i> $2n - 8 = 96$ $2n = 104$ $n = 52$</p> <p>\therefore two terms are/<i> twee terme is:</i> $T_{52} = 52^2 - 9(52) + 7 = 2243$ $T_{53} = 53^2 - 9(53) + 7 = 2339$</p> <p>OR/OF</p> <p>$T_n - T_{n-1} = 96$ $(n^2 - 9n + 7) - [(n-1)^2 - 9(n-1) + 7] = 96$ $n^2 - 9n + 7 - n^2 + 2n - 1 + 9n - 9 - 7 = 96$ $2n = 106$ $n = 53$ $T_{52} = 52^2 - 9(52) + 7 = 2243$ $T_{53} = 53^2 - 9(53) + 7 = 2339$</p>	<p>$\checkmark - 6 + (n - 1)(2) = 96$ $\checkmark 52$</p> <p>$\checkmark 2\ 243$ $\checkmark 2\ 339$ (4)</p> <p>$\checkmark 2n - 8 = 96$</p> <p>$\checkmark 52$</p> <p>$\checkmark 2\ 243$ $\checkmark 2\ 339$ (4)</p> <p>$\checkmark T_n - T_{n-1} = 96$</p> <p>$\checkmark 53$ $\checkmark 2\ 243$ $\checkmark 2\ 339$ (4)</p>
	<p>OR/OF</p> <p>$T_{n+1} - T_n = 96$ $[(n+1)^2 - 9(n+1) + 7] - [n^2 - 9n + 7] = 96$ $n^2 + 2n + 1 - 9n - 9 + 7 - n^2 + 9n - 7 = 96$ $2n = 104$ $n = 52$ $T_{52} = 52^2 - 9(52) + 7 = 2243$ $T_{53} = 53^2 - 9(53) + 7 = 2339$</p>	<p>$\checkmark T_{n+1} - T_n = 96$</p> <p>$\checkmark 52$</p> <p>$\checkmark 2\ 243$ $\checkmark 2\ 339$ (4)</p>

<p>3.2.1</p>	$T_{12} = 16\left(\frac{1}{4}\right)^{12-1}$ $= \frac{1}{4^9} \text{ or } 4^{-9} \text{ or } \frac{1}{2^{18}} \text{ or } 2^{-18}$	<p>✓ $a = 16$ and $r = \frac{1}{4}$ ✓ subst. into correct formula/ <i>subt in korrekte formule</i> ✓ answer/antwoord (3)</p>
<p>3.2.2</p>	$S_{10} = \frac{16\left(1 - \left(\frac{1}{4}\right)^{10}\right)}{1 - \frac{1}{4}}$ $= 21,33$ <p>OR/OF</p> $S_{10} = \frac{16\left(\left(\frac{1}{4}\right)^{10} - 1\right)}{\frac{1}{4} - 1}$ $= 21,33$	<p>✓ substitution into correct formula /<i>substitusie in korrekte formule</i> ✓ answer/antwoord (2)</p> <p>✓ substitution into correct formula /<i>substitusie in korrekte formule</i> ✓ answer/antwoord (2)</p>
<p>3.3</p>	$\left(1 + \frac{1}{2}\right)\left(1 + \frac{1}{3}\right)\left(1 + \frac{1}{4}\right) \dots \left(1 + \frac{1}{99}\right)$ $= \left(\frac{3}{2}\right)\left(\frac{4}{3}\right)\left(\frac{5}{4}\right)\left(\frac{6}{5}\right) \dots \left(\frac{100}{99}\right)$ $= \left(\frac{100}{2}\right)$ $= 50$ <p>OR/OF</p> $\left(1 + \frac{1}{2}\right)\left(1 + \frac{1}{3}\right)\left(1 + \frac{1}{4}\right) \dots \left(1 + \frac{1}{99}\right)$ $T_1 = \left(1 + \frac{1}{2}\right) = \frac{3}{2}$ $T_2 = \frac{3}{2}\left(1 + \frac{1}{3}\right) = \frac{3}{2} \times \frac{4}{3} = 2$ $T_3 = 2\left(1 + \frac{1}{4}\right) = 2 \times \frac{5}{4} = \frac{5}{2}$ <p>$\frac{3}{2}, 2, \frac{5}{2} \dots$ is an arithmetic sequence with $a = \frac{3}{2}$ and $d = \frac{1}{2}$</p> $\therefore T_{98} = \frac{3}{2} + (98 - 1)\frac{1}{2}$ $= \frac{100}{2} = 50$	<p>✓ improper fractions/ <i>onegte breuke</i> ✓ $\left(1 + \frac{1}{99}\right)$ or $\left(\frac{100}{99}\right)$ ✓✓ answer/antwoord (4)</p> <p>✓ $\left(1 + \frac{1}{99}\right)$ ✓ giving the first three terms / <i>gee die eerste drie terme</i></p> <p>✓✓ answer /antwoord (4) [19]</p>

QUESTION/VRAAG 4

4.1	$p = 1$ $q = 1$	$\checkmark p$ value /waarde $\checkmark q$ value /waarde (2)
4.2	$0 = \frac{2}{x+1} + 1$ $-x - 1 = 2$ $x = -3$ OR/OF Reflect (0 ; 3) across $y = -x$ to get T(-3 ; 0) $x = -3$ <i>Reflekteer</i> (0 ; 3) <i>om</i> $y = -x$ <i>om</i> T(-3 ; 0) <i>te kry</i> $x = -3$	$\checkmark 0 = \frac{2}{x+1} + 1$ $\checkmark x = -3$ \checkmark reflect across/ <i>reflekteer om</i> $y = -x$ $\checkmark x = -3$ (2)
4.3	Shifting g five units to the left shifts (- 1 ; 0) five units to the left. $x = - 6$	\checkmark answer/ <i>antwoord</i> (1)
4.4	$\frac{2}{x+1} + 1 = x$ $2 + x + 1 = x^2 + x$ $x^2 = 3$ $\therefore x = \sqrt{3}$ since at S, $x > 0$ $y = \sqrt{3} = 1,73\dots$ $OS^2 = x^2 + y^2 = 3 + 3 = 6$ $\therefore OS = \sqrt{6} = 2,45$ units/ <i>eenhede</i> OR/OF	\checkmark equating both graphs/ <i>stel grafieke gelyk</i> $\checkmark x^2 = 3$ $\checkmark x = \sqrt{3}$ and $y = \sqrt{3}$ $\checkmark OS^2 = 6$ \checkmark answer/ <i>antwoord</i> (5)

	<p>Translate g one unit down and one unit to the right/<i>Transleer g een eenheid af en een eenheid na regs</i></p> <p>The new equation/<i>Die nuwe vergelyking</i> : $p(x) = \frac{2}{x}$</p> <p>Therefore the image of S is $S'(\sqrt{2}; \sqrt{2})$/ <i>Daarom is die beeld van S nou $S'(\sqrt{2}; \sqrt{2})$</i></p> <p>Now translate p back to g/<i>Transleer p terug na g</i>: $S(\sqrt{2} - 1; \sqrt{2} + 1)$</p> <p>$OS^2 = (\sqrt{2} - 1)^2 + (\sqrt{2} + 1)^2 = 2 - 2\sqrt{2} + 1 + 2 + 2\sqrt{2} + 1$</p> <p>$\therefore OS = \sqrt{6} = 2,45$ units/<i>eenhede</i></p>	<p>✓ $p(x) = \frac{2}{x}$</p> <p>✓✓ coord. of/<i>koörd. van S'</i></p> <p>✓ coord. of/<i>koörd. van S</i></p> <p>✓ answer/<i>antwoord</i> (5)</p>
4.5	<p>$k < 3$ will give roots with opposite signs/ <i>$k < 3$ sal wortels met teenoorgestelde tekens gee</i></p>	<p>✓ $k < 3$ (1)</p> <p style="text-align: right;">[11]</p>

QUESTION 5

5.1	$y = \log_a x$ $-1 = \log_a \frac{1}{3}$ $a^{-1} = \frac{1}{3}$ $a = \left(\frac{1}{3}\right)^{-1}$ $\therefore a = 3$	\checkmark subt. $\left(\frac{1}{3}; -1\right)$ $\checkmark a^{-1} = \frac{1}{3}$ or $a = \left(\frac{1}{3}\right)^{-1}$ (2)
5.2	$h: x = \log_3 y$ $\therefore y = 3^x$	\checkmark swop x and y /ruil x en y \checkmark answer/antwoord (2)
5.3	$g(x) = -\log_3 x$ OR/OF $g(x) = \log_3 \frac{1}{x}$ OR/OF $g(x) = \log_{\frac{1}{3}} x$ OR/OF $x = 3^{-y}$ OR/OF $x = \left(\frac{1}{3}\right)^y$	\checkmark answer/antwoord (1) \checkmark answer/antwoord (1) \checkmark answer/antwoord (1) \checkmark answer/antwoord (1) \checkmark answer/antwoord (1)
5.4	$x > 0$ OR/OF $(0; \infty)$	\checkmark answer/antwoord (1) \checkmark answer/antwoord (1)
5.5	$\log_3 x = -3$ $x = 3^{-3}$ $x = \frac{1}{27}$ $x \geq \frac{1}{27}$	\checkmark exponential form/ <i>eksponensiële vorm</i> \checkmark simplification/vereenvoudiging \checkmark answer/antwoord (3) [9]

QUESTION/VRAAG 6

6.1	$4x^2 - 6 = 0$ $x^2 = \frac{3}{2}$ $x = 1,22$ (x -coordinate of S is positive)	$\checkmark y = 0$ $\checkmark 1,22$ (2)
6.2	(0 ; -6)	$\checkmark 0$ $\checkmark -6$ (2)
6.3.1	$QT = f(x) - g(x)$ $= 2\sqrt{x} - (4x^2 - 6)$ or $= 2\sqrt{x} - 4x^2 + 6$	$\checkmark\checkmark$ correct formula/ <i>korrekte formule</i> \checkmark substitution/substitusie (3)
6.3.2	$QT = 2x^{\frac{1}{2}} - 4x^2 + 6$ Derivative of $QT = x^{-\frac{1}{2}} - 8x = 0$ $\frac{1}{\sqrt{x}} = 8x$ $x^{\frac{3}{2}} = \frac{1}{8}$ or $\frac{1}{x} = 64x^2$ $x = \left(\frac{1}{8}\right)^{\frac{2}{3}}$ $x = \left(\frac{1}{2}\right)^2$ or $x^3 = \frac{1}{64}$ $x = \frac{1}{4} = 0,25$ Max/Maks $QT = 2\left(\frac{1}{4}\right)^{\frac{1}{2}} - 4\left(\frac{1}{4}\right)^2 + 6$ $= 6\frac{3}{4} = 6,75$ units/eenhede	\checkmark derivative/afgeleide \checkmark derivative equal to 0/ <i>afgeleide gelyk aan 0</i> $\checkmark x^{\frac{3}{2}} = \frac{1}{8}$ $\checkmark x$ -value/ x -waarde \checkmark substitution/substitusie \checkmark answer/antwoord (6) [13]

QUESTION/VRAAG 7

<p>7.1</p>	$A = P(1 - i)^n$ $72\,500 = 145\,000(1 - i)^5$ $i = 1 - \sqrt[5]{\frac{72500}{145000}}$ $= 0,1294\dots$ <p>∴ Rate of interest/Rentekoers is 12,94 % p.a./p.j.</p> <p>OR/OF</p> $(1 - i)^5 = \frac{1}{2}$ $\therefore i = 1 - \left(\frac{1}{2}\right)^{\frac{1}{5}}$ $i = 0,1294$ <p>∴ Rate of interest/Rentekoers is 12,94 % p.a./p.j.</p>	<p>✓ substitution/substitusie</p> <p>✓ writing in terms of <i>i</i> herskryf in terme van <i>i</i></p> <p>✓ answer/antwoord (3)</p> <p>✓ substitution/substitusie</p> <p>✓ writing i.t.o <i>i</i></p> <p>✓ answer (3)</p>
<p>7.2.1</p>	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $500\,000 = \frac{x \left[1 - \left(1 + \frac{0,12}{12} \right)^{-240} \right]}{\frac{0,12}{12}}$ $x = \frac{500000 \times \frac{0,12}{12}}{\left[1 - \left(1 + \frac{0,12}{12} \right)^{-240} \right]}$ $x = R5505,43$	<p>✓ $i = \frac{0,12}{12}$</p> <p>✓ $n = 240$</p> <p>✓ substitution into correct formula</p> <p>✓ answer/antwoord (4)</p>

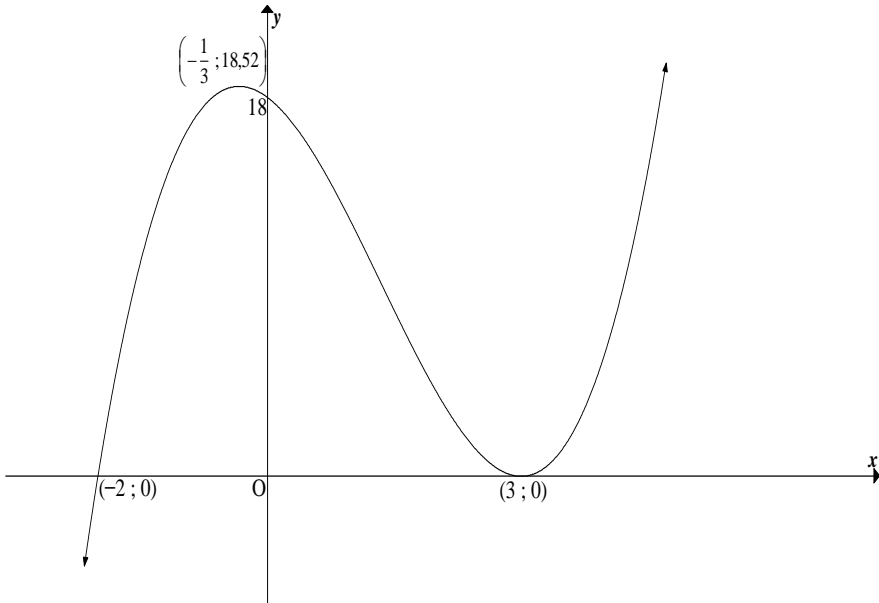
<p>7.2.2</p>	$P = \frac{x[1 - (1+i)^{-n}]}{i}$ $500000 = \frac{6000 \left[1 - \left(1 + \frac{0,12}{12} \right)^{-n} \right]}{\frac{0,12}{12}}$ $\frac{500000}{6000} \times 0,01 = 1 - (1,01)^{-n}$ $(1,01)^{-n} = 1 - \frac{5}{6}$ $-n = \frac{\log \frac{1}{6}}{\log 1,01}$ $n = 180,07$ <p>∴ Melissa settles the loan in 181 months</p>	<p>✓ 6000</p> <p>✓ substitute into correct formula/substitusie in korrekte formule</p> <p>✓ use of logs/gebruik van logs</p> <p>✓ answer/antwoord (4)</p>
<p>7.2.3</p>	<p>Samuel He is paying off his loan over a longer period thus more interest will be paid./Hy betaal sy lening oor 'n langer tydperk af, dus sal hy meer rente betaal.</p> <p>OR/OF</p> <p>Samuel He will pay/Hy betaal $R5505,43 \times 240 - R500\,000 = R821\,303,20$ She will pay between/Sy sal tussen $R580\,000$ and/en $R586\,000,00$ betaal.</p>	<p>✓ Samuel</p> <p>✓ reason/rede (2)</p> <p>✓ Samuel</p> <p>✓ reason/rede (2)</p> <p>[13]</p>

QUESTION/VRAAG 8

8.1	$f(x+h) = (x+h)^3 = (x^2 + 2xh + h^2)(x+h)$ $= x^3 + x^2h + 2x^2h + 2xh^2 + h^2x + h^3$ $= x^3 + 3x^2h + 3xh^2 + h^3$ $f(x+h) - f(x) = x^3 + 3x^2h + 3xh^2 + h^3 - x^3$ $= 3x^2h + 3xh^2 + h^3$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{3x^2h + 3xh^2 + h^3}{h}$ $= \lim_{h \rightarrow 0} \frac{h(3x^2 + 3xh + h^2)}{h}$ $= \lim_{h \rightarrow 0} (3x^2 + 3xh + h^2)$ $= 3x^2$ <p>OR/OF</p> $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{(x+h)^3 - x^3}{h}$ $= \lim_{h \rightarrow 0} \frac{(x+h)(x+h)^2 - x^3}{h}$ $= \lim_{h \rightarrow 0} \frac{(x+h)(x^2 + 2xh + h^2) - x^3}{h}$ $= \lim_{h \rightarrow 0} \frac{x^3 + 3x^2h + 3xh^2 + h^3 - x^3}{h}$ $= \lim_{h \rightarrow 0} \frac{h(3x^2 + 3xh + h^2)}{h}$ $= \lim_{h \rightarrow 0} (3x^2 + 3xh + h^2)$ $= 3x^2$ <p>OR</p>	<p>✓ simplifying/vereenvoudiging</p> <p>✓ formula/formule</p> <p>✓ subst. into formula/subst. in formule</p> <p>✓ factorization/faktorisering</p> <p>✓ answer/antwoord (5)</p> <p>✓ formula/formule</p> <p>✓ subst. into formula/subst. in formule</p> <p>✓ simplifying/vereenvoudiging</p> <p>✓ factorization/faktorisering</p> <p>✓ answer/antwoord (5)</p>
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	$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{(x+h)^3 - x^3}{h}$ $= \lim_{h \rightarrow 0} \frac{(x+h-x)(x^2 + 2xh + h^2 + x^2 + xh + x^2)}{h}$ $= \lim_{h \rightarrow 0} \frac{h(3x^2 + 3xh + h^2)}{h}$ $= \lim_{h \rightarrow 0} (3x^2 + 3xh + h^2)$ $= 3x^2$	✓ formula/formule ✓ subst. into formula/subst. in formule ✓ factorization/faktorisering ✓ simplifying/vereenvoudiging ✓ answer/antwoord (5)
8.2	$f'(x) = 4x + 2x^3$	✓ 4x ✓ 2x ³ (2)
8.3	$y = x^{12} - 2x^6 + 1$ $\frac{dy}{dx} = 12x^{11} - 12x^5$ $= 12x^5(x^6 - 1)$ $= 12x^5\sqrt{y}$	✓ simplification/vereenvoudiging ✓ derivative/afgeleide ✓ factors/faktore (3)
8.4	$f(x) = 2x^3 - 2x^2 + 4x - 1$ $f'(x) = 6x^2 - 4x + 4$ $f''(x) = 12x - 4$ <p>f is concave up when/is konkkaaf op as $f''(x) > 0$</p> $\therefore 12x - 4 > 0$ $12x > 4$ $x > \frac{1}{3}$	✓ first derivative/eerste afgeleide ✓ second derivative/tweede afgeleide ✓ $f''(x) > 0$ ✓ $x > \frac{1}{3}$ (4) [14]

QUESTION/VRAAG 9

<p>9.1</p>	<p>$f'(x) = 3x^2 - 8x - 3 = 0$</p> <p>$(3x + 1)(x - 3) = 0$</p> <p>$x = -\frac{1}{3}$ or $x = 3$</p> <p>$y = \frac{500}{27}$ (or $y = 18\frac{14}{27}$ or 18,52) $y = 0$</p> <p>Turning points are/Draaipunte is $(-\frac{1}{3}; \frac{500}{27})$ and $(3; 0)$</p>	<p>✓ derivative/afgeleide ✓ derivative/afgeleide = 0 ✓ factors/faktore ✓ x-values/waardes ✓ each y-values/elke y-waarde</p> <p>(6)</p>
<p>9.2</p>		<p>✓ x-intercepts/afsnitte ✓ y-intercept/afsnit ✓ turning points/draaipunte ✓ shape/vorm</p> <p>(4)</p>
<p>9.3</p>	<p>$x < -\frac{1}{3}$ or $0 < x < 3$</p> <p>OR</p> <p>$(-\infty; -\frac{1}{3}) \cup (0; 3)$</p>	<p>✓ $x < -\frac{1}{3}$ ✓ both critical points/beide kritieke-punte ✓ notation/notasie</p> <p>(3)</p>

QUESTION/VRAAG 10



10.1	$l + 2h = 40$ $l = 40 - 2h$	✓ answer (1)
10.2	$2b + 2h = 100$ $b = 50 - h$ $V = lbh$ $V = h(40 - 2h)(50 - h)$	✓ $2b + 2h = 100$ ✓ $b = 50 - h$ ✓ volume formula (3)
10.3	$V = (50h - h^2)(40 - 2h)$ $V = 2h^3 - 140h^2 + 2000h$ $V' = 6h^2 - 280h + 2000 = 0$ $h = \frac{280 \pm \sqrt{(-280)^2 - 4(6)(2000)}}{2(6)}$ $h \neq 37,86$ or $h = 8,80$ \therefore for a box as large as possible, $h = 8,80$ cm <i>vir die grootste moontlike boks = 8,80 cm</i>	✓ simplifying/vereenvoudig ✓ derivative / afgeleide ✓ ✓ h -values in any form / h -waardes in enige vorm ✓ answer/antwoord (5)

[9]**QUESTION/VRAAG 11**

11.1.1	$P(\text{male/manlik}) = \frac{83}{180}$ or 0,46 or 46,11%	✓ answer/antwoord (1)
11.1.2	$P(\text{not game park/nie wildreservaat})$ $= 1 - P(\text{game park/wildreservaat})$ $= 1 - \frac{62}{180}$ $= \frac{59}{90}$ or 0,66 or 65,56% OR/OF $P(\text{not game park/nie wildreservaat})$ $= \frac{98}{180} + \frac{20}{180}$ $= \frac{118}{180}$ $= \frac{59}{90}$ or 0,66 or 65,56%	✓ $1 - \frac{62}{180}$ ✓ answer/antwoord (2) ✓ $\frac{98}{180} + \frac{20}{180}$ ✓ answer/antwoord (2)

<p>11.2</p> <p>Events are independent if /<i>Gebeure is onafhanklike indien</i> $P(\text{male}) \times P(\text{home}) = P(\text{male and home})$ $P(\text{manlik}) \times P(\text{huis}) = P(\text{manlik en huis})$ $P(\text{male/manlik}) = \frac{83}{180}$</p> <p>and/en $P(\text{home/huis}) = \frac{20}{180}$ or 0,11 or 11,11%</p> <p>$P(\text{male/manlik}) \times P(\text{home/huis})$ $= \frac{83}{180} \times \frac{20}{180}$ $= \frac{83}{1620}$ $= 0,05123$ or 5,12%</p> <p>$P(\text{male and home/manlik en huis})$ $= \frac{13}{180}$ $= 0,07222\dots$ or 7,22%</p> <p>Therefore $P(\text{male}) \times P(\text{home}) \neq P(\text{male and home})$ Dus $P(\text{manlik}) \times P(\text{huis}) \neq P(\text{manlik en huis})$ Thus the events are not independent./<i>Dus is die gebeure nie onafhanklik nie</i></p> <p>OR/OF</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th>Home/Huis</th> <th>Not Home/ Nie huis</th> <th></th> </tr> </thead> <tbody> <tr> <td>M</td> <td>13</td> <td>70</td> <td>83</td> </tr> <tr> <td>F</td> <td>7</td> <td>90</td> <td>97</td> </tr> <tr> <td></td> <td>20</td> <td>160</td> <td>180</td> </tr> </tbody> </table> <p>$P(\text{female/vroulik}) \times P(\text{not home/nie huis})$ $= \frac{97}{180} \times \frac{160}{180}$ $= \frac{194}{405}$ $= 0,479012345\dots$ or 47,90%</p> <p>$P(\text{female and not home/vroulik en nie-huis})$ $= \frac{90}{180}$ $= 0,5$ or 50%</p> <p>Therefore $P(\text{female}) \times P(\text{not home}) \neq P(\text{female and not home})$ Thus the events are not independent. Dus $P(\text{vroulik}) \times P(\text{nie-huis}) \neq P(\text{vroulik en nie-huis})$ Dus is die gebeure nie onafhanklik nie.</p>		Home/Huis	Not Home/ Nie huis		M	13	70	83	F	7	90	97		20	160	180	<p>✓$P(m) \times P(h)$ and their values/en hulle waardes</p> <p>✓ answer of product</p> <p>✓$P(m \text{ and/en } h)$ value/waarde</p> <p>✓ conclusion/afleiding (4)</p> <p>✓$P(f) \times P(\text{not } h)$ and their values/en hulle waardes</p> <p>✓ answer of product</p> <p>✓$P(f \text{ and/en not } h)$ value/waarde</p> <p>✓ conclusion/afleiding (4)</p> <p style="text-align: right;">[7]</p>
	Home/Huis	Not Home/ Nie huis															
M	13	70	83														
F	7	90	97														
	20	160	180														

QUESTION/VRAAG 12

12.1.1	$26 \times 25 \times 24 \times 23 \times 22$ $= 7\,893\,600$ OR/OF ${}^{26}P_5 = \frac{26!}{(26-5)!} = \frac{26!}{21!} = 7\,893\,600$	$\checkmark 26 \times 25 \times 24 \times 23 \times 22$ $\checkmark 7\,893\,600$ (2) \checkmark formula/formule \checkmark answer/antwoord (2)
12.1.2	$24 \times 23 \times 22$ $= 12\,144$	$\checkmark 24 \times 23 \times 22$ $\checkmark 12\,144$ (2)
12.2.1	$7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1$ $= 5\,040$	\checkmark product/produk $\checkmark 5\,040$ (2)
12.2.2	$(3 \times 2 \times 1)(5 \times 4 \times 3 \times 2 \times 1)$ $= 720$ OR/OF The five 'units' can be parked in $5 \times 4 \times 3 \times 2 \times 1$ ways./Die vyf 'eenhede' kan op $5 \times 4 \times 3 \times 2 \times 1$ maniere geparkeer word. The three silver cars can be parked in $3 \times 2 \times 1$ ways./Die drie silwer motors kan op $3 \times 2 \times 1$ maniere parkeer word. So there are $(3 \times 2 \times 1)(5 \times 4 \times 3 \times 2 \times 1) = 720$ ways to park the cars./Dus is daar $(3 \times 2 \times 1)(5 \times 4 \times 3 \times 2 \times 1) = 720$ maniere om die motors te parkeer. OR/OF Suppose for the moment the 3 silver cars are at one end./Veronderstel die drie silwer motors is op die punt. The 3 cars can be arranged in $3 \times 2 \times 1 = 6$ ways./Die 3 motors kan op $3 \times 2 \times 1 = 6$ maniere gerangskik word. For each of them the remaining four cars can be arranged in $4 \times 3 \times 2 \times 1 = 24$ ways./Die 4 oorblywende motors kan op $4 \times 3 \times 2 \times 1 = 24$ maniere rangskik word. So $6 \times 24 = 144$ ways if all 3 cars at one end./Dus is daar $6 \times 24 = 144$ maniere as die 3 motors op die punt is.   Together, the silver cars can only occupy 5 different positions amongst the 7 positions. ./Saam kan die silwer motors slegs 5 verskillende posisies hê tussen die 7 moontlike posisies. \therefore Total ways/Totale getal maniere = $5 \times 144 = 720$	$\checkmark 3 \times 2 \times 1$ $\checkmark 5 \times 4 \times 3 \times 2 \times 1$ $\checkmark 720$ (3) $\checkmark 5 \times 4 \times 3 \times 2 \times 1$ $\checkmark 3 \times 2 \times 1$ $\checkmark 720$ (3) $\checkmark 6 \times 24 = 144$ $\checkmark 5 \times 144$ $\checkmark 720$ (3) [9]

TOTAL/TOTAAL: 150