



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE/GRAAD 12

MATHEMATICS P1/WISKUNDE VI

EXEMPLAR 2014/MODEL 2014

MEMORANDUM

MARKS: 150

PUNTE: 150

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

NOTE:

- If a candidate answers a question/vraag 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 in ALLE aspekte van die memorandum van toepassing.

QUESTION/VRAAG 1

1.1.1	$3x^2 - 4x = 0$ $x(3x - 4) = 0$ $x = \frac{4}{3} \quad \text{or} \quad x = 0$	✓ factors ✓ both answers (2)
1.1.2	$x - 6 + \frac{2}{x} = 0$ $x^2 - 6x + 2 = 0$ $x = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(1)(2)}}{2(1)}$ $= \frac{6 \pm \sqrt{28}}{2}$ $x = 0,35 \quad \text{or} \quad x = 5,65$ <p>OR</p> $x - 6 + \frac{2}{x} = 0$ $x^2 - 6x + 2 = 0$ $(x - 3)^2 = -2 + 9$ $(x - 3) = \pm\sqrt{7}$ $x = 3 \pm \sqrt{7}$ $x = 0,35 \quad \text{or} \quad x = 5,65$	$\checkmark x^2 - 6x + 2 = 0$ $\checkmark \text{subs into}$ correct formula $\checkmark x = 0,35$ $\checkmark x = 5,65$ (4)
1.1.3	$x^{\frac{2}{3}} = 4; \quad x > 0$ $x = (2^2)^{\frac{3}{2}}$ $x = 8$ <p>OR</p>	$\checkmark x = (2^2)^{\frac{3}{2}}$ $\checkmark x = 8$ (2)

	$x^{\frac{2}{3}} = 4; x > 0$ $x = (4)^{\frac{3}{2}}$ $x = 8$ <p>OR</p> $x^{\frac{2}{3}} = 4$ $x^{\frac{2}{3}} - 4 = 0$ $\left(x^{\frac{1}{3}} - 2\right)\left(x^{\frac{1}{3}} + 2\right) = 0$ $x = (-2)^3 \text{ or } x = 2^3$ $x = -8 \text{ or } x = 8$ $x = 8 \ (x > 0)$	<p>✓ $x = (4)^{\frac{3}{2}}$</p> <p>✓ $x = 8$</p> <p style="text-align: right;">(2)</p> <p>✓ factors</p> <p>✓ $x = 8$</p> <p style="text-align: right;">(2)</p>		
1.1.4	$3^x(x - 5) < 0$ $3^x \text{ is always positive}$ $x - 5 < 0$ $x < 5$	<table border="1"> <tr> <td> <p>Answer only</p> <p>full marks</p> </td> </tr> </table>	<p>Answer only</p> <p>full marks</p>	<p>✓ $3^x > 0$</p> <p>✓ $x < 5$</p> <p style="text-align: right;">(2)</p>
<p>Answer only</p> <p>full marks</p>				
1.2	$y = x^2 - x - 6 \text{ and } 2x - y = 2$ $2x - (x^2 - x - 6) = 2$ $-x^2 + 3x + 6 = 2$ $x^2 - 3x - 4 = 0$ $(x - 4)(x + 1) = 0$ $x = -1 \text{ or } x = 4$ $y = -4 \text{ or } y = 6$ <p>OR</p> $y = x^2 - x - 6 \text{ and } 2x - y = 2$ $y = 2x - 2$ $2x - 2 = x^2 - x - 6$ $x^2 - 3x - 4 = 0$ $(x - 4)(x + 1) = 0$ $x = -1 \text{ or } x = 4$ $y = -4 \text{ or } y = 6$	<p>✓ subst $y = x^2 - x - 6$</p> <p>✓ standard form</p> <p>✓ factors</p> <p>✓ x-values</p> <p>✓✓ y-values</p> <p style="text-align: right;">(6)</p> <p>✓ $y = 2x - 2$</p> <p>✓ standard form</p> <p>✓ factors</p> <p>✓ x-values</p> <p>✓✓ y-values</p>		

	<p>OR</p> $y = x^2 - x - 6 \quad \text{and} \quad 2x - y = 2$ $x = \frac{y+2}{2}$ $y = \left(\frac{y+2}{2}\right)^2 - \left(\frac{y+2}{2}\right) - 6$ $y = \left(\frac{y^2 + 4y + 4}{4}\right) - \left(\frac{2y+4}{4}\right) - 6$ $4y = y^2 + 2y - 24$ $y^2 - 2y - 24 = 0$ $(y-6)(y+4) = 0$ $y = -4 \text{ or } y = 6$ $x = -1 \text{ or } x = 4$	<p>(6)</p> <p>✓ $x = \frac{y+2}{2}$</p> <p>✓ standard form ✓ factors</p> <p>✓ y - values ✓ x - values</p> <p>(6)</p>
1.3	$\sqrt{3} \cdot \sqrt{48} - \frac{4^{x+1}}{2^{2x}}$ $= \sqrt{3} \cdot 4\sqrt{3} - \frac{2^{2x+2}}{2^{2x}}$ $= 12 - 4$ $= 8$ <p>OR</p> $\sqrt{3} \cdot \sqrt{48} - \frac{4^{x+1}}{2^{2x}}$ $= \sqrt{144} - \frac{2^{2x+2}}{2^{2x}}$ $= 12 - 4$ $= 8$	<p>✓ 2^{2x+2}</p> <p>✓ 4 ✓ answer</p> <p>(3)</p> <p>✓ 2^{2x+2}</p> <p>✓ 4 ✓ answer</p> <p>(3)</p>
1.4.1	<p>No, there will be no intersection between the graphs. Min value of $3(x-1)^2 + 5$ is 5 <i>Nee, daar sal geen snyding tussen die grafieke wees nie.</i> Min waarde van $3(x-1)^2 + 5$ is 5</p> <p>OR</p> $3(x-1)^2 + 5 = 3$ $3(x-1)^2 = -2$ $(x-1)^2 \neq -\frac{2}{3}$ <p>No, there will be no intersection between the graphs.</p>	<p>✓ answer ✓ reason</p> <p>(2)</p> <p>✓ reason</p> <p>✓ answer</p>

	<p><i>Nee, daar sal geen snyding tussen die grafieke wees nie.</i></p> <p>OR</p> $3(x-1)^2 + 5 = 3$ $3(x^2 - 2x + 1) + 2 = 0$ $3x^2 - 6x + 5 = 0$ $\Delta = (-6)^2 - 4(3)(5)$ $= -24$ < 0 <p>No, there is no solution to the equation $f(x) = g(x)$ <i>Nee, daar is geen oplossing vir die vergelyking $f(x) = g(x)$</i></p>	<p>(2)</p> <p>✓ reason</p> <p>✓ answer</p> <p>(2)</p>
1.4.2	$3(x-1)^2 + 5 = 3 + k$ $3(x-1)^2 = k - 2$ $k - 2 > 0 \text{ for all real values of } x / \text{vir alle reële waardes van } x$ $k > 2$ <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p>Answer only full marks</p> </div> <p>OR</p> $3x^2 - 6x + 3 + 5 = 3 + k$ $3x^2 - 6x + 5 - k = 0$ $\Delta = (-6)^2 - 4(3)(5 - k)$ $= 36 - 60 + 12k$ $= 12k - 24$ <p>For real unequal roots / <i>Vir reële ongelyke wortels</i></p> $12k - 24 > 0$ $12k > 24$ $k > 2$	<p>✓ ✓ answer</p> <p>(2)</p> <p>✓ ✓ answer</p> <p>(2)</p> <p>[23]</p>

QUESTION/VRAAG 2

2.1.1	$T_n = a + (n-1)d$ $300 = 18 + (n-1)6$ $300 = 18 + 6n - 6$ $6n = 288$ $n = 48$	✓ $a = 18$ and $d = 6$ ✓ $T_n = 300$ ✓ answer (3)
2.1.2	$S_n = \frac{n}{2}[2a + (n-1)d]$ $= \frac{48}{2}[2(18) + 47(6)]$ $= 7632$	✓ substitution in formula ✓ answer (2)
2.1.3	Sum of all numbers from 1 to 300 / <i>Som van alle getalle van 1 tot 300</i> $= \frac{300}{2}[2(1) + 299(1)]$ $= \frac{300(301)}{2}$ $= 45150$ Sum of numbers not divisible by 6 / <i>Som van getalle wat nie deelbaar deur 6 is nie</i> $= 45150 - (7632 + 6 + 12)$ $= 37500$	✓ substitution ✓ answer ✓ $(7632 + 6 + 12)$ ✓ answer (4)
2.2.1	16, 8; 4; $r = \frac{1}{2}$ $T_n = ar^{n-1}$ $= 16\left(\frac{1}{2}\right)^{n-1}$ $= 2^4(2^{-n+1})$ $= 2^{5-n}$	✓ $r = \frac{1}{2}$ ✓ answer (in any format) (2)
2.2.2	$16 + 8 + 4 + 2 + 1 + \frac{1}{2} = 31$ $S_5 = 31$ $n > 5 \quad \text{or} \quad n \geq 6$	✓ $16 + 8 + 4 + 2 + 1 + \frac{1}{2}$ ✓ $S_5 = 31$ ✓ $n > 5 / n \geq 6$ (3)

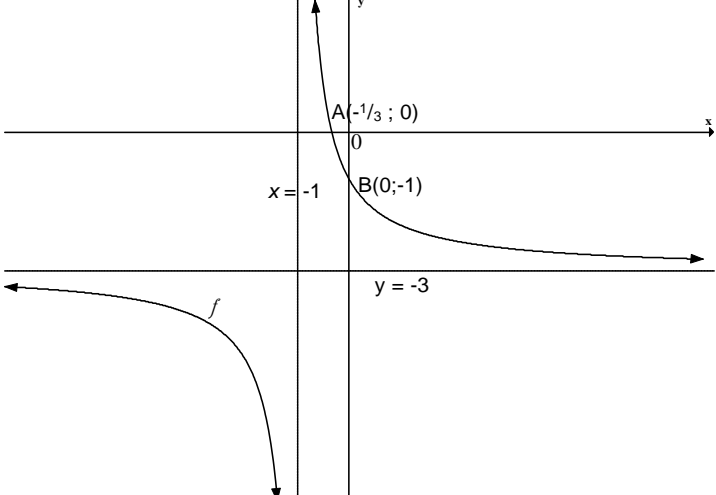
	<p>OR</p> $S_n = \frac{a(1-r^n)}{1-r}$ $31 < \frac{16\left(1-\frac{1}{2}^n\right)}{1-\frac{1}{2}}$ $31 < 32(1-2^{-n})$ $\frac{31}{32} - 1 < -2^{-n}$ $\frac{1}{32} > 2^{-n}$ $2^{-5} > 2^{-n}$ $n > 5$ <p>or</p> $n \geq 6$	<p>✓ $S_n > 31$</p> <p>✓ simplification</p> <p>✓ $n > 5 / n \geq 6$</p> <p>(3)</p>
2.2.3	$S_\infty = \frac{a}{1-r}$ $= \frac{16}{1-\frac{1}{2}}$ $= 32$ <p>OR</p> $16 + 8 + 4 + 2 + 1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \frac{1}{32} + \frac{1}{64} + \frac{1}{128} \dots\dots$ <p>Answer gets <u>closer and closer to 32</u> the more terms gets added together <i>Antwoord beweeg nader en nader aan 32 hoe meer terme bymekaar getel word</i></p>	<p>✓ substitution of a and r</p> <p>✓ answer</p> <p>(2)</p> <p>✓ expanding the series</p> <p>✓ answer</p> <p>(2)</p> <p>[16]</p>

QUESTION/VRAAG 3

<p>3.1.1</p>	<p>1; x ; y; z.....</p> <p style="text-align: center;">$T_n = 4n + 6$ 10; 14; 18.....</p> <div style="text-align: center;"> </div> <p>$2a = 4$ $a = 2$ OR $T_n = 4n + 6$ $d = 4$ $2a = 4$ $a = 2$</p>	<p>2^{nd} difference = 4</p> <p>✓ $2a = 4$ ✓ $a = 2$ (2)</p> <p>✓ $2a = 4$ ✓ $a = 2$ (2)</p>
<p>3.1.2</p>	<div style="text-align: center;"> </div> <p>$3a + b = 10$ $6 + b = 10$ $b = 4$</p> <p>$a + b + c = 1$ $2 + 4 + c = 1$ $c = -5$</p> <p>$T_n = 2n^2 + 4n - 5$</p>	<p>✓ 1^{st} differences 10; 14; 18.....</p> <p>✓ $3a + b = 10$</p> <p>✓ $a + b + c = 1$</p> <p>✓ $T_n = 2n^2 + 4n - 5$ (4)</p>

3.2	<p>Consider the sequence made up by the first factors of each term: <i>Beskou die ry wat deur die eerste faktore van elke term gevorm word:</i> 1; 5; 9; 13; ... 81 An arithmetic sequence / <i>rekenkundige ry:</i></p> $T_n = a + (n-1)d$ $= 1 + (n-1)4$ $= 4n - 3$ <p>To find the no. of terms: $81 = 4n - 3$ <i>Aantal terme:</i> $4n = 84$ $\therefore n = 21$</p> <p>The second factor is 1 more than the first factor / <i>Tweede faktor is 1 meer as die eerste faktor:</i></p> $T_n = 4n - 3 + 1$ $= 4n - 2$ <p>OR</p> <p>Consider the sequence made up by the second factors of each term: <i>Beskou die ry wat deur die tweede faktore van elke term gevorm word:</i> 2; 6; 10; 14; ...82 Also an arithmetic sequence / <i>rekenkundige ry:</i></p> $T_n = a + (n-1)d$ $= 2 + (n-1)4$ $= 4n - 2$ <p>In sigma notation:</p> $\sum_{n=1}^{21} (4n - 3)(4n - 2) \quad \text{or} \quad \sum_{n=1}^{21} 2(4n - 3)(2n - 1) \quad \text{or} \quad \sum_{n=1}^{21} (16n^2 - 20n + 6)$	<p>✓ $T_n = 4n - 3$</p> <p>✓ no. of terms</p> <p>✓ $T_n = 4n - 2$</p> <p>✓ $T_n = 4n - 2$</p> <p>✓ answer in sigma notation</p> <p>(4) [10]</p>
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QUESTION/VRAAG 4

<p>4.1.1</p>	$f(x) = \frac{2}{x+1} - 3$ $y = f(0)$ $= \frac{2}{0+1} - 3$ $= -1$ $(0 ; -1)$	<p>✓ subst $x = 0$</p> <p>✓ $(0 ; -1)$</p> <p>(2)</p>
<p>4.1.2</p>	$0 = \frac{2}{x+1} - 3$ $3 = \frac{2}{x+1}$ $3x + 3 = 2$ $x = -\frac{1}{3}$ $\left(-\frac{1}{3} ; 0\right)$	<p>✓ subs $y = 0$</p> <p>✓ $\left(-\frac{1}{3} ; 0\right)$</p> <p>(2)</p>
<p>4.1.3</p>		<p>✓ shape</p> <p>✓ both intercepts correct</p> <p>✓ horizontal and vertical asymptote</p> <p>(3)</p>
<p>4.1.4</p>	$y = -(x+1) - 3$ $y = -x - 4$ <p>OR</p> $y = -x + k$ $-3 = -(-1) + k$ $k = -4$ $y = -x - 4$	<p>✓ $y = -(x+1) - 3$</p> <p>✓ $y = -x - 4$</p> <p>(2)</p> <p>✓ $-3 = -(-1) + k$</p> <p>✓ $y = -x - 4$</p> <p>(2)</p>

4.2.1	$y = a.b^x + q$ $y = a.b^x - 3$ $-2 = a.b^0 - 3 \quad [\text{subs } (0; -2)]$ $a = 1$ $y = 1.b^x - 3 \quad [\text{subs } (1;-1)]$ $-1 = b^1 - 3$ $b = 2$ $f(x) = 2^x - 3$	<p>✓ subs $q = -3$</p> <p>✓ $a = 1$</p> <p>✓ $b = 2$</p> <p>✓ $f(x) = 2^x - 3$</p> <p>(4)</p>
4.2.2	<p>A translation of 4 units up and 1 unit to the left. <i>'n Translasie van 4 eenhede na bo en 1 eenheid na links.</i></p> <p>OR</p> <p>Dilation by a factor of 2 and 7 units up. <i>Verkleining deur faktor van 2 en 7 eenhede na bo.</i></p>	<p>✓ 4 units up</p> <p>✓ 1 unit to the left</p> <p>(2)</p> <p>✓ dilation by factor 2</p> <p>✓ 7 units up</p> <p>(2)</p> <p>[15]</p>

QUESTION/VRAAG 5

5. 1	$f(x) = -2x^2 - 5x + 3$ $x = -\frac{b}{2a} \quad \text{or} \quad f'(x) = 0$ $x = -\left(\frac{-5}{2(-2)}\right) \quad -4x - 5 = 0$ $x = -\frac{5}{4} \quad x = -\frac{5}{4}$ $y = -2\left(-\frac{5}{4}\right)^2 - 5\left(-\frac{5}{4}\right) + 3$ $= \frac{49}{8} / 6,125$ $\text{TP} \left(-\frac{5}{4}; \frac{49}{8}\right)$ <p>OR</p> $y = -2\left(x^2 + \frac{5}{2}x - \frac{3}{2}\right)$ $= -2\left[\left(x + \frac{5}{4}\right)^2 - \frac{25}{16} - \frac{3}{2}\right]$ $= -2\left[\left(x + \frac{5}{4}\right)^2 - \frac{49}{16}\right]$ $= -2\left(x + \frac{5}{4}\right)^2 + \frac{49}{8}$ $\text{TP} \left(-\frac{5}{4}; \frac{49}{8}\right)$	$\checkmark x = -\frac{b}{2a} / f'(x) = 0$ $\checkmark x = -\frac{5}{4}$ $\checkmark y = \frac{49}{8} / 6,125$ <p style="text-align: right;">(3)</p> $\checkmark -2\left[\left(x + \frac{5}{4}\right)^2 - \frac{25}{16} - \frac{3}{2}\right]$ $\checkmark x = -\frac{5}{4}$ $\checkmark y = \frac{49}{8} / 6,125$ <p style="text-align: right;">(3)</p>
5. 2	$m_{\text{tangent}} = \tan 135^\circ$ $= -1$ $-4x - 5 = -1$ $-4x = 4$ $x = -1$ $y = -2(-1)^2 - 5(-1) + 3$ $= 6$ <p style="text-align: center;">Point of contact: P(-1; 6)</p>	$\checkmark \tan 135^\circ = -1$ $\checkmark -4x - 5 = -1$ $\checkmark x = -1$ $\checkmark y = 6$ <p style="text-align: right;">(4)</p>
5. 3	<p>Eq of g:</p> $y - y_1 = m(x - x_1)$ $y - 6 = -1(x + 1)$ $y = -x + 5$	\checkmark substitute in equation \checkmark answer <p style="text-align: right;">(2)</p>
5. 4	$d > 5$	\checkmark answer <p style="text-align: right;">(1)</p> <p style="text-align: right;">[10]</p>

QUESTION/VRAAG 6

6.1	$g(x) = \sqrt{ax}$ $4 = \sqrt{a(8)}$ $8a = 16$ $a = 2$	✓ subst (8 ; 4) ✓ $a = 2$ (2)
6.2	$x \geq 0$	✓ answer (1)
6.3	$y \geq 0$	✓ answer (1)
6.4	$y = \sqrt{2x} ; x \geq 0$ $x^2 = 2y$ $y = \frac{x^2}{2} ; y \geq 0$	✓ interchange x and y ✓ answer (2)
6.5	$\sqrt{2x} = x - 4$ $2x = x^2 - 8x + 16$ $0 = x^2 - 10x + 16$ $0 = (x - 8)(x - 2)$ $x = 8$ or $x = 2$ when $x = 2$, LHS = 2 but RHS = -2 Hence $x = 8$ only	✓ $2x = x^2 - 8x + 16$ (squaring both sides) ✓ factors ✓ $x = 8$ or $x = 2$ ✓ selects $x = 8$ (4)
6.6	$0 < x < 8$	✓ $x < 8$ ✓ $0 < x$ (2) [12]

QUESTION/VRAAG 7

7.1	$\text{Selling price / Verkoopprys} = \frac{102\,000}{0,12}$ $= 850\,000$	✓ 850 000 (1)
7.2	$P_v = \frac{x[1 - (1 + i)^{-n}]}{i}$ $748\,000 = \frac{x \left[1 - \left(1 + \frac{0,09}{12} \right)^{-240} \right]}{\frac{0,09}{12}}$ $x = 6\,729,95$ <p>OR</p> $F_v = \frac{x[(1 + i)^n - 1]}{i}$ $748\,000 \left(1 + \frac{0,09}{12} \right)^{240} = \frac{x \left[\left(1 + \frac{0,09}{12} \right)^{240} - 1 \right]}{\frac{0,09}{12}}$ $x = 6\,729,95$	✓ $P_v = 748\,000$ ✓ $i = \frac{0,09}{12}$ ✓ $n = -240$ ✓ $x = R6\,729,95$ (4)
7.3	$\text{Total interest paid / Totale rente betaal}$ $= (6\,729,95 \times 240) - 748\,000$ $= R\,867\,188$	✓ $(6\,729,95 \times 240)$ ✓ 867 188 (2)
7.4	$\text{Balance} = \frac{x[1 - (1 + i)^{-n}]}{i}$ $= \frac{6729,95 \left[1 - \left(1 + \frac{0,09}{12} \right)^{-155} \right]}{\frac{0,09}{12}}$ $x = 615\,509,74$ <p>OR</p>	✓ 6729,95 ✓ $n = -155$ ✓ R615 509,74 (3)

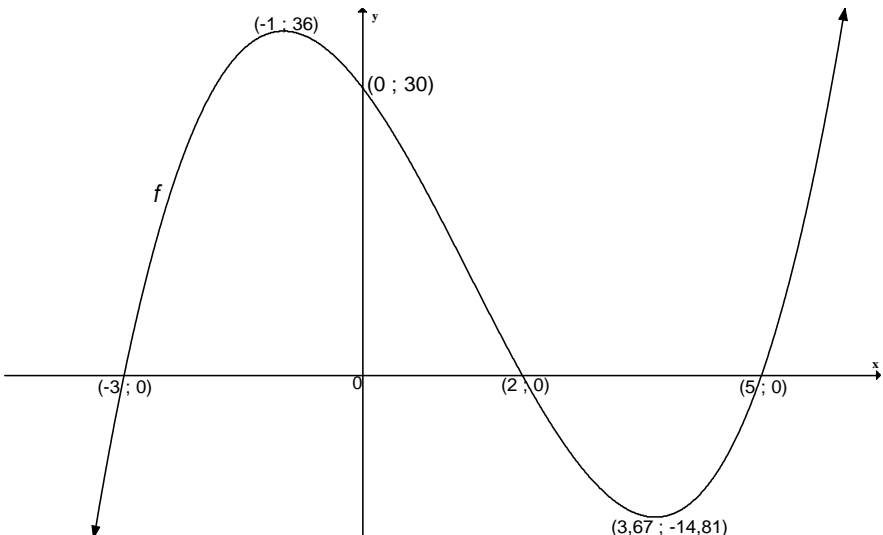
	$A = 748\,000 \left(1 + \frac{0,09}{12}\right)^{85}$ $= 1\,411\,663,732$ $F_v = \frac{x[(1+i)^n - 1]}{i}$ $= \frac{6729,95 \left[\left(1 + \frac{0,09}{12}\right)^{85} - 1 \right]}{\frac{0,09}{12}}$ $= 796\,153,962$ <p>Balance of loan = $1\,411\,663,732 - 796\,153,962$</p> $= 615\,509,77$ <p>OR</p> $\text{Balance} = 748\,000 \left(1 + \frac{0,09}{12}\right)^{85} - \frac{6729,95 \left[\left(1 + \frac{0,09}{12}\right)^{85} - 1 \right]}{\frac{0,09}{12}}$ $= 615\,509,77$	<p>✓ 1 411 663,732 ✓ $n = 85$</p> <p>✓ R615 509,77 (3)</p> <p>✓ subs of 748 000 and 6729,95 ✓ $n = 85$ ✓ R615 509,77 (3)</p>
7.5	<p>New value of bond:</p> $615\,509,74 \left(1 + \frac{0,09}{12}\right)^4 \quad \text{or} \quad 615\,509,77 \left(1 + \frac{0,09}{12}\right)^4$ $= 634\,183,81 \quad \quad \quad = 634\,183,84$	<p>✓</p> $R615\,509,74 \left(1 + \frac{0,09}{12}\right)^4$ <p>✓ R634 183,81/ R634 183,84 (2)</p>
7.6	$634\,183,81 = \frac{8\,500 \left[1 - \left(1 + \frac{0,09}{12}\right)^{-n} \right]}{\frac{0,09}{12}}$ $\log(0,44042605) = -n \log \left(1 + \frac{0,09}{12}\right)$ $n = 109,74$ $= 110 \text{ months}$ <p>OR</p>	<p>✓ $x = 8\,500$ ✓ subs into correct formula ✓ use of logs ✓ answer (4)</p>

	$634\,183,81 = \frac{8\,500 \left[1 - \left(1 + \frac{0,09}{12} \right)^{-n} \right]}{\frac{0,09}{12}}$ $-n = \log_{\left(1 + \frac{0,09}{12} \right)} (0,44042605)$ $n = 109,74$ $= 110 \text{ months}$	<ul style="list-style-type: none">✓ $x = 8\,500$✓ subs into correct formula✓ use of logs✓ answer <p style="text-align: right;">(4) [16]</p>
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QUESTION/VRAAG 8

8.1	$f(x) = 3x^2 - 2$ $f(x+h) = 3(x+h)^2 - 2$ $= 3x^2 + 6xh + 3h^2 - 2$ $f(x+h) - f(x) = 6xh + 3h^2$ $f'(x) = \lim_{h \rightarrow 0} \frac{6xh + 3h^2}{h}$ $= \lim_{h \rightarrow 0} \frac{h(6x + 3h)}{h}$ $= \lim_{h \rightarrow 0} (6x + 3h)$ $= 6x$ <p>OR</p> $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{[3(x+h)^2 - 2] - (3x^2 - 2)}{h}$ $= \lim_{h \rightarrow 0} \frac{[3(x^2 + 2xh + h^2) - 2] - 3x^2 + 2}{h}$ $= \lim_{h \rightarrow 0} \frac{[3x^2 + 6xh + 3h^2 - 2] - 3x^2 + 2}{h}$ $= \lim_{h \rightarrow 0} \frac{6xh + 3h^2}{h}$ $= \lim_{h \rightarrow 0} \frac{h(6x + 3h)}{h}$ $= \lim_{h \rightarrow 0} (6x + 3h)$ $= 6x$	<p>✓ substitution of of $x + h$</p> <p>✓ simplification to $6xh + 3h^2$</p> <p>✓ formula</p> <p>✓ taking out common factor</p> <p>✓ answer (5)</p> <p>✓ formula</p> <p>✓ substitution of $x + h$</p> <p>✓ simplification to $\frac{6xh + 3h^2}{h}$</p> <p>✓ taking out common factor</p> <p>✓ answer (5)</p>
8.2	$y = 2x^{-4} - \frac{x}{5}$ $\frac{dy}{dx} = -8x^{-5} - \frac{1}{5}$	<p>✓ $-8x^{-5}$</p> <p>✓ $-\frac{1}{5}$</p> <p>(2) [7]</p>

QUESTION/VRAAG 9

9.1	$(x - 2)$ is a factor of f / is 'n faktor van f .	✓ answer (1)
9.2	$f(x) = x^3 - 4x^2 - 11x + 30$ $= (x - 2)(x^2 - 2x - 15)$ $= (x - 2)(x + 3)(x - 5)$ $f(x) = 0$ $(x + 3)(x - 2)(x - 5) = 0$ $x = -3 \text{ or } x = 2 \text{ or } x = 5$ x-intercepts: $(-3; 0); (2; 0); (5; 0)$	✓ $(x^2 - 2x - 15)$ ✓ $(-3; 0)$ ✓ $(2; 0)$ ✓ $(5; 0)$ (4)
9.3	$f(x) = x^3 - 4x^2 - 11x + 30$ $f'(x) = 3x^2 - 8x - 11$ At turning points $f'(x) = 0$ $(3x - 11)(x + 1) = 0$ $x = -1 \text{ or } x = \frac{11}{3}$ $y = 36 \quad y = -\frac{400}{27} \quad (-14,81)$ TP's are $(-1; 36)$ and $(\frac{11}{3}; -14,81)$	✓ $f'(x) = 3x^2 - 8x - 11$ ✓ $f'(x) = 0$ ✓ x - value ✓ x - value ✓ y - values (5)
9.4		✓ y and x - intercepts ✓ shape ✓ turning points (3)

9.5	$f'(x) < 0$ if $-1 < x < 3,67$ OR $(-1 ; 3,67)$	✓ extreme values ✓ notation (2) ✓ extreme values ✓ notation (2) [15]
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QUESTION/VRAAG 10

10.1	<p>After t hours: $BF = 30t$ km and $CD = 40t$ km</p> $\therefore BC = 100 - 40t$ $FC = \sqrt{(30t)^2 + (100 - 40t)^2}$ $= \sqrt{900t^2 + 10000 - 8000t + 1600t^2}$ $= \sqrt{2500t^2 - 8000t + 10000}$	<p>✓ $BF = 30t$</p> <p>✓ $BC = 100 - 40t$</p> <p>✓ Pythagoras</p> <p>✓ answer</p> <p>(4)</p>
10.2	<p>FC is a minimum when FC^2 is a minimum.</p> $FC^2 = 2500t^2 - 8000t + 10000$ $\frac{dFC^2}{dt} = 5000t - 8000 = 0$ $t = \frac{8000}{5000} = 1,6\text{hrs (96 minutes)}$	<p>✓ $FC^2 =$ $2500t^2 - 8000t + 10000$</p> <p>✓ $\frac{dFC^2}{dt} = 5000t - 8000$</p> <p>✓ $\frac{dFC^2}{dt} = 0$</p> <p>✓ answer</p> <p>(4)</p>
10.3	$FC = \sqrt{2500t^2 - 8000t + 10000}$ $= \sqrt{2500(1.6)^2 - 8000(1.6) + 10000}$ $= 60$ <p>They will be 60km apart.</p>	<p>✓ subs into equation</p> <p>✓ answer</p> <p>(2)</p> <p>[10]</p>

QUESTION/VRAAG 11

<p>11.1</p>	<p> $P(A \text{ or } B) = P(A) + P(B)$ $0,57 = P(A) + 2P(A)$ $0,57 = 3P(A)$ $P(A) = 0,19$ $\therefore P(B) = 2(0,19)$ $= 0,38$ </p>	<p> $\checkmark P(A \text{ or } B) = P(A) + P(B)$ $\checkmark P(A) = 0,19$ \checkmark answer (3) </p>
<p>11.2.1</p>	<p> A tree diagram starting from a root point. The first level branches into A (up) and B (down), both with probability $\frac{1}{2}$. From A, the second level branches into P (up) with probability $\frac{3}{5}$ and Y (down) with probability $\frac{2}{5}$. From B, the second level branches into P (up) with probability $\frac{5}{9}$ and Y (down) with probability $\frac{4}{9}$. To the right of the branches, the outcomes are listed: A,P for the top branch; A,Y and B,P for the middle branches; and B;Y for the bottom branch. </p>	<p> \checkmark first tier \checkmark second tier \checkmark probabilities \checkmark outcomes (4) </p>
<p>11.2.2</p>	<p> $P(A,Y) = \left(\frac{1}{2}\right)\left(\frac{2}{5}\right)$ $= \frac{1}{5}$ </p>	<p> \checkmark answer (1) </p>
<p>11.2.3</p>	<p> $P(P) = \left(\frac{1}{2}\right)\left(\frac{3}{5}\right) + \left(\frac{1}{2}\right)\left(\frac{5}{9}\right)$ $= \frac{3}{10} + \frac{5}{18}$ $= \frac{26}{45}$ </p>	<p> $\checkmark \left(\frac{1}{2}\right)\left(\frac{3}{5}\right)$ $\checkmark \left(\frac{1}{2}\right)\left(\frac{5}{9}\right)$ \checkmark answer (3) [11] </p>

QUESTION/VRAAG 12

12.1	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="padding: 5px;">5</td> <td style="padding: 5px;">4</td> <td style="padding: 5px;">3</td> <td style="padding: 5px;">2</td> <td style="padding: 5px;">1</td> </tr> </table> <p>Number of different letter arrangements: <i>Aantal verskillende letter rangskikkings wat gevorm kan word:</i></p> $5! = 5 \times 4 \times 3 \times 2 \times 1$ $= 120$	5	4	3	2	1	<p>✓5! ✓120</p> <p style="text-align: right;">(2)</p>
5	4	3	2	1			
12.2	<p>S and T can be arranged in 2! different ways. The remaining three letters can be arranged in 3! different ways</p> <p>∴ Total number of different letter arrangements having S and T as the first two letters = 2!.3!</p> <p><i>S en T kan op 2! verskillende maniere rangskik word. Die 3 letters wat oorbly kan op 3! verskillende maniere rangskik word</i></p> <p>∴ Totale aantal letterrangskikkings waarin S en T die eerste twee letters van die rangskikking sal wees = 2!.3!</p> $P(\text{having S and T as first two letters}) = \frac{2! \cdot 3!}{120}$ $= \frac{2 \cdot 6}{120}$ $= \frac{1}{10}$	<p>✓2! ✓3!</p> <p>✓answer</p> <p style="text-align: right;">(3) [5]</p>					

TOTAL/TOTAAL: 150