



**basic education**

Department:  
Basic Education  
**REPUBLIC OF SOUTH AFRICA**

**NATIONAL  
SENIOR CERTIFICATE/  
*NASIONALE SENIOR  
SERTIFIKAAT***

**GRADE 12/GRAAD 12**

**MATHEMATICS P1/WISKUNDE V1**

**NOVEMBER 2021**

**MARKING GUIDELINES/NASIENRIGLYNE**

**MARKS/PUNTE: 150**

**These marking guidelines consist of 16 pages.  
*Hierdie nasienriglyne bestaan uit 16 bladsye.***

**NOTE:**

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

**LET WEL:**

- Indien 'n kandidaat 'n vraag TWEE keer beantwoord, sien slegs die EERSTE poging na.
- Volgehoue akkuraatheid is op ALLE aspekte van die nasienriglyne van toepassing.

**QUESTION/VRAAG 1**

1.1.1	$\begin{aligned}x^2 - 2x - 24 &= 0 \\(x-6)(x+4) &= 0 \\x = 6 \text{ or } x &= -4\end{aligned}$	✓ factors ✓ $x = 6$ ✓ $x = -4$ (3)
1.1.2	$\begin{aligned}2x^2 - 3x - 3 &= 0 \\x &= \frac{3 \pm \sqrt{(-3)^2 - 4(2)(-3)}}{2(2)} \\x &= \frac{3 \pm \sqrt{33}}{4} \\x = 2,19 \text{ or } x &= -0,69\end{aligned}$	✓ substitution into the correct formula  ✓ $x = 2,19$ ✓ $x = -0,69$ (3)
1.1.3	$\begin{aligned}x^2 + 5x &\leq -4 \\x^2 + 5x + 4 &\leq 0 \\(x+4)(x+1) &\leq 0 \\ \text{Critical values: } x &= -4 \text{ or } x = -1\end{aligned}$ <p style="text-align: center;">   <math>-4 \leq x \leq -1 \quad \text{OR/OF} \quad x \in [-4 ; -1]</math> </p>	✓ standard form ✓ critical values  ✓ ✓ answer (4)
1.1.4	$\begin{aligned}\sqrt{x+28} &= 2-x \\(\sqrt{x+28})^2 &= (2-x)^2 \\x+28 &= 4-4x+x^2 \\x^2 - 5x - 24 &= 0 \\(x-8)(x+3) &= 0 \\x \neq 8 \quad \text{or} \quad x &= -3\end{aligned}$	✓ squaring both sides  ✓ standard form ✓ factors ✓ answers with selection (4)

1.2	$\begin{aligned} 2y &= 3 + x \\ x &= 2y - 3 \quad \dots (1) \\ 2xy + 7 &= x^2 + 4y^2 \quad \dots (2) \\ 2y(2y - 3) + 7 &= (2y - 3)^2 + 4y^2 \\ 4y^2 - 6y + 7 &= 4y^2 - 12y + 9 + 4y^2 \\ 4y^2 - 6y + 2 &= 0 \\ 2y^2 - 3y + 1 &= 0 \\ (2y - 1)(y - 1) &= 0 \\ y = \frac{1}{2} \text{ or } y &= 1 \\ x = -2 \text{ or } x &= -1 \end{aligned}$	<ul style="list-style-type: none"> <li>✓ equation 1</li> <li>✓ substitution</li> <li>✓ simplification</li> <li>✓ standard form</li> <li>✓ <math>y</math>-values</li> <li>✓ <math>x</math>-values</li> </ul> <p>(6)</p>
<b>OR/OF</b>	$\begin{aligned} 2y &= 3 + x \\ y &= \frac{3}{2} + \frac{x}{2} \quad \dots (1) \\ 2xy + 7 &= x^2 + 4y^2 \quad \dots (2) \\ 2x\left(\frac{3}{2} + \frac{x}{2}\right) + 7 &= x^2 + 4\left(\frac{3}{2} + \frac{x}{2}\right)^2 \\ 3x + x^2 + 7 &= x^2 + 9 + 6x + x^2 \\ x^2 + 3x + 2 &= 0 \\ (x + 2)(x + 1) &= 0 \\ x = -2 \text{ or } x &= -1 \\ y = \frac{1}{2} \text{ or } y &= 1 \end{aligned}$	<ul style="list-style-type: none"> <li>✓ equation 1</li> <li>✓ substitution</li> <li>✓ simplification</li> <li>✓ standard form</li> <li>✓ <math>x</math>-values</li> <li>✓ <math>y</math>-values</li> </ul> <p>(6)</p>
1.3	$\begin{aligned} \frac{n}{m} &= \frac{p}{n} \\ n^2 &= mp \\ \Delta &= b^2 - 4ac \\ \Delta &= n^2 - 4mp, \text{ but } n^2 = mp \\ \Delta &= n^2 - 4n^2 \quad \textbf{OR/OF} \quad \Delta = mp - 4mp \\ \Delta &= -3n^2 \quad \quad \quad \Delta = -3mp \\ n^2 > 0 & \quad \quad \quad mp > 0 \\ \therefore -3n^2 < 0 & \quad \quad \quad \therefore -3mp < 0 \\ \\ \therefore \Delta < 0 \Rightarrow x &\text{ is a non-real number} \end{aligned}$	<ul style="list-style-type: none"> <li>✓ <math>\frac{n}{m} = \frac{p}{n}</math></li> <li>✓ <math>n^2 = mp</math></li> <li>✓ <math>\Delta = -3n^2</math> or <math>-3mp</math></li> <li>✓ <math>\Delta &lt; 0</math></li> </ul> <p>(4)</p>
		[24]

**QUESTION/VRAAG 2**

2.1	$\frac{90}{x} = \frac{81}{90}$ $81x = 8100$ $x = 100$ <p><b>OR/OF</b></p> $x = 90 \times \frac{10}{9}$ $x = 100$	$\checkmark \frac{90}{x} = \frac{81}{90}$ $\checkmark$ answer (2)
2.2	$S_n = \frac{a(1-r^n)}{1-r}$ $S_n = \frac{100(1-(0,9)^n)}{1-0,9}$ $S_n = \frac{100(1-(0,9)^n)}{0,1}$ $\therefore S_n = 1\ 000(1-(0,9)^n)$	$\checkmark r = 0,9$ $\checkmark$ substitution into correct formula (2)
2.3	$S_\infty = \frac{a}{1-r}$ $S_\infty = \frac{100}{1-\frac{9}{10}}$ $S_\infty = 1000$ <p><b>OR/OF</b></p> $S_\infty = \lim_{n \rightarrow \infty} [1\ 000(1-(0,9)^n)]$ $S_\infty = 1000$	$\checkmark$ substitution $\checkmark$ answer (2)
<b>[6]</b>		

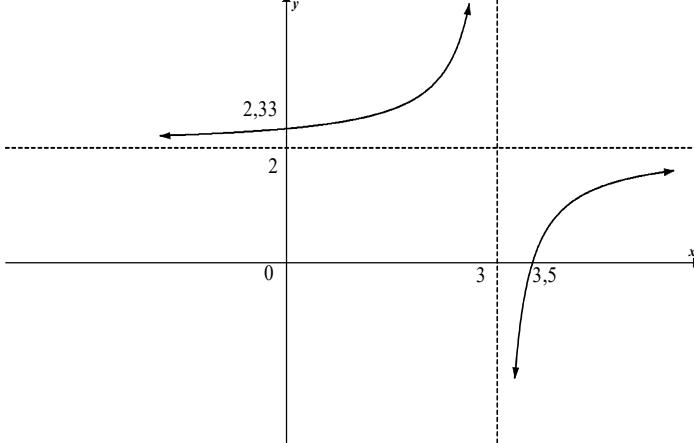
**QUESTION 3**

3.1	-82	✓ answer (1)
3.2	$\begin{array}{ccccccc} & -145 & ; & -122 & ; & -101 & ; \dots \\ & \swarrow & \searrow & \swarrow & \searrow & \swarrow & \dots \\ & 23 & & 21 & & & \\ & \swarrow & \searrow & \swarrow & \searrow & \swarrow & \dots \\ & -2 & & -2 & & & \end{array}$ <p> <math>2a = -2 \therefore a = -1</math>  <math>3a + b = 23 \therefore 3(-1) + b = 23 \therefore b = 26</math>  <math>a + b + c = -145 \therefore -1 + 26 + c = -145 \therefore c = -170</math>  <math>\therefore T_n = -n^2 + 26n - 170</math> </p> <p><b>OR/OF</b></p> <p> <math>2a = -2 \therefore a = -1</math>  <math>c = -145 + (-2) - 23 = -170</math>  <math>\therefore T_n = -n^2 + bn - 170</math>  <math>-145 = -1 + b - 170</math>  <math>b = 26</math>  <math>\therefore T_n = -n^2 + 26n - 170</math> </p>	$\checkmark 2a = -2$ $\checkmark 3(-1) + b = 23$ $\checkmark -1 + 26 + c = -145$ (3)
3.3	$T_n = bn + c$ $T_n = -2n + 25$ $-2n + 25 = -121$ $-2n = -146$ $n = 73$ Between $T_{73}$ and $T_{74}$	$T_n = a + (n-1)d$ or $= 23 + (n-1)(-2)$ $= 25 - 2n$ $\checkmark T_n = -2n + 25$ $\checkmark T_n = -121$ $\checkmark n = 73$ $\checkmark$ answer (4)
	<p><b>OR/OF</b></p> $T_{n+1} - T_n = -(n+1)^2 + 26(n+1) - 170 - (-n^2 + 26n - 170)$ $-121 = -2n + 25$ $n = 73$ Between $T_{73}$ and $T_{74}$	$\checkmark T_n = -2n + 25$ $\checkmark T_n = -121$ $\checkmark n = 73$ $\checkmark$ answer (4)
3.4	$n = \frac{-b}{2a} = \frac{-26}{2(1)} = 13$ $T_{13} = -1$ $\therefore$ add 2	$\checkmark 13$ $\checkmark T_{13} = -1$ $\checkmark$ add 2 (3)
	<p><b>OR/OF</b></p> $T'_n = -2n + 26 = 0$ $n = 13$ $T_{13} = -(13)^2 + 26(13) - 170 = -1$ $\therefore$ add 2	$\checkmark 13$ $\checkmark T_{13} = -1$ $\checkmark$ add 2 (3)
		[11]

**QUESTION/VRAAG 4**

4.1	$a = 5$ and $d = 2$ $T_{51} = 5 + (51-1)(2)$ $= 105$	✓ $a$ and $d$ ✓ substitution into correct formula ✓ answer (3)
4.2	$S_n = \frac{n}{2}[2a + (n-1)d]$  $S_{51} = \frac{51}{2}[2(5) + (51-1)2]$ or/of $S_{51} = \frac{51}{2}[5 + 105]$ $= 2805$ $= 2805$	✓ substitution into correct formula ✓ answer (2)
4.3	$\sum_{n=1}^{5000} (2n+3) = 5 + 7 + 9 + \dots + 10003$	✓ expansion (1)
4.4	$T_1 = -3$ $T_{4999} = -2(4999) - 1 = -9999$  $\therefore \sum_{n=1}^{5000} (2n+3) + \sum_{n=1}^{4999} (-2n-1)$ $= (5 + 7 + 9 + \dots + 9999 + 10001 + 10003) +$ $(-3 - 5 - 7 - 9 - \dots - 9999)$ $= 10001 + 10003 - 3$ $= 20001$ <p><b>OR/OF</b></p> $S_{4999} = \frac{4999}{2} [2(-3) + (4999-1)(-2)] = -24999999$  $S_{5000} = \frac{5000}{2} ((2)(5) + (5000-1)(2)) = 25020000$  $\sum_{n=1}^{5000} (2n+3) + \sum_{n=1}^{4999} (-2n-1) = 25020000 - 24999999$ $= 20001$	✓ $T_1 = -3$ ✓ $T_{4999} = -9999$  ✓ both expansions  ✓ answer (A) (4) <p><b>OR/OF</b></p> ✓ $T_1 = -3$ ✓ $S_{4999} = -24999999$  ✓ $S_{5000} = 25020000$  ✓ answer (A) (4)
		<b>[10]</b>

**QUESTION/VRAAG 5**

5.1	$x = 3$ $y = 2$	$\checkmark x = 3$ $\checkmark y = 2$ (2)
5.2	$x \in R, x \neq 3$  <b>OR/OF</b>  $x \in (-\infty ; 3) \cup (3 ; \infty)$  <b>OR/OF</b>  $x < 3 \text{ or } x > 3$	$\checkmark$ answer (1)  <b>OR/OF</b>  $\checkmark$ answer (1)  <b>OR/OF</b>  $\checkmark$ answer (1)
5.3	$0 = \frac{-1}{x-3} + 2$ $-2x + 6 = -1$ $x = \frac{7}{2}$ $x\text{-int: } \left(\frac{7}{2}; 0\right)$	$\checkmark y = 0$  $\checkmark$ answer (2)
5.4	$y\text{-int: } \left(0; \frac{7}{3}\right)$	$\checkmark x = 0$ $\checkmark \frac{7}{3}$ (2)
5.5		$\checkmark$ asymptotes $\checkmark$ intercepts with the axes $\checkmark$ shape (3)
		[10]

**QUESTION/VRAAG 6**

6.1	$f(x) = \log_4 x$ $2 = \log_4 k$ $4^2 = k$ $\therefore k = 16$	✓ substitution of ( $k ; 2$ )  ✓ answer (2)
6.2	$-1 = \log_4 x \therefore x = \frac{1}{4}$ $\frac{1}{4} \leq x \leq 16 \quad \text{or/of} \quad x \in \left[ \frac{1}{4} ; 16 \right]$	✓ $x = \frac{1}{4}$  ✓ answer (2)
6.3	$f(x) = \log_4 x$ $y = \log_4 x$ $x = \log_4 y$ $y = 4^x$	✓ swopping $x$ and $y$  ✓ answer (2)
6.4	$x < 0$  <b>OR/OF</b>  $x \in (-\infty ; 0)$	✓✓ answer  <b>OR/OF</b>  ✓✓ answer (2)
		<b>[8]</b>

**QUESTION 7**

7.1	B( $-4 ; 0$ ) D( $6 ; 0$ )	$\checkmark$ B( $-4 ; 0$ ) $\checkmark$ D( $6 ; 0$ ) (2)
7.2	$f(x) = x^2 - 2x - 24$ $x_{tp} = \frac{-b}{2a}$ <b>OR/OF</b> $2x - 2 = 0$ <b>OR/OF</b> $x = \frac{-4+6}{2}$ $x = \frac{-(-2)}{2(1)}$ $\therefore x_{tp} = 1$ $y_{tp} = f(1)$ $= 1^2 - 2(1) - 24$ $= -25$ C( $1 ; -25$ )	$\checkmark x_{tp} = 1$  $\checkmark y_{tp} = -25$ (2)
7.3	$y \geq -25$ <b>OR/OF</b> $y \in [-25 ; \infty)$	$\checkmark$ answer (1)  <b>OR/OF</b>  $\checkmark$ answer (1)
7.4.1	$m_{AE} = \tan 14,04^\circ = 0,25 = \frac{1}{4}$	$\checkmark$ answer (1)
7.4.2	$m_{\text{tang}} = -4$ $f'(x) = 2x - 2$ $2x - 2 = -4$ $x_T = -1$ $y_T = -21$	$\checkmark m_{\text{tang}} = -4$ $\checkmark f'(x) = 2x - 2$  $\checkmark$ equating $\checkmark x_T = -1$ $\checkmark y_T = -21$ (5)
7.5	$m_{\text{line}} = \frac{1}{4}$ $y + 9 = \frac{1}{4}(x + 3)$ <b>OR/OF</b> $-9 = \frac{1}{4}(-3) + c$ $y + 9 = \frac{1}{4}x + \frac{3}{4}$ $c = -\frac{33}{4} = -8,25$ $y = \frac{1}{4}x - \frac{33}{4}$ <b>OR/OF</b> $y = 0,25x - 8,25$ $x^2 - 2x - 24 = \frac{1}{4}x - \frac{33}{4}$ $4x^2 - 8x - 96 = x - 33$ $4x^2 - 9x - 63 = 0$ $(4x - 21)(x + 3) = 0$ $\therefore x = \frac{21}{4} = 5,25 \quad \text{or} \quad x \neq -3$	$\checkmark m_{\text{line}} = \frac{1}{4}$  $\checkmark$ substitution $m$ and K( $-3 ; -9$ )  $\checkmark y = \frac{1}{4}x - \frac{33}{4}$  $\checkmark$ equating  $\checkmark$ standard form  $\checkmark$ answer with selection (6)
		[17]

**QUESTION/VRAAG 8**

8.1	$A = P(1 - i)^n$ $A = 980\ 000(1 - 0,092)^7$ $A = R498\ 685,82$	✓ correct formula ✓ substitution ✓ answer (A) (3)
8.2	$A = P(1 + i)^n$ $116\ 253,50 = 75\ 000 \left(1 + \frac{0,068}{4}\right)^{4n}$  $1,550\ 046\ 667 = (1,017)^{4n}$ $\log(1,550\ 046\ 667) = 4n \log(1,017)$ $4n = \frac{\log(1,550\ 046\ 667)}{\log(1,017)}$ or $4n = \log_{1,017}(1,550\ 046\ 667)$ $4n = 25,99 \dots$ $n = 6,50$ years	✓ $\frac{0,068}{4}$ ✓ substitution in correct formula  ✓ correct use of logs  ✓ answer (4)
8.3.1	$F = \frac{x[(1+i)^n - 1]}{i}$  $450\ 000 = \frac{x \left[ \left(1 + \frac{0,0835}{12}\right)^{60} - 1 \right]}{\frac{0,0835}{12}}$  $x = R6\ 068,69$	✓ $i = \frac{0,0835}{12}$  ✓ substitution into correct formula  ✓ answer (3)
8.3.2(a)	$P = \frac{x[1 - (1+i)^{-n}]}{i}$  $P = \frac{11\ 058,85 \left[1 - \left(1 + \frac{0,12}{12}\right)^{-4 \times 12}\right]}{\frac{0,12}{12}}$  $P = R419\ 948,32$  <b>OR/OF</b>  $\text{Balance} = A - F$ $= P(1 + i)^n - \frac{x[(1+i)^n - 1]}{i}$ $= 1\ 050\ 000 \left(1 + \frac{0,12}{12}\right)^{12 \times 21} - \frac{11\ 058,85 \left[\left(1 + \frac{0,12}{12}\right)^{12 \times 21} - 1\right]}{\frac{0,12}{12}}$ $= R12\ 887\ 702,20 - R12\ 467\ 749,81$ $= R419\ 952,39$	✓ $n = 48$ in P-formula  ✓ substitution into correct formula  ✓ answer (A) (3)  <b>OR/OF</b>  ✓ $n = 252$ in both formulae  ✓ subst into correct formulae  ✓ answer (A) (3)

8.3.2(b)	<p>Total paid = <math>11\ 058,85 \times 21 \times 12 = 2\ 786\ 830,20</math>          Loan Paid = <math>1\ 050\ 000 - 419\ 948,32 = 630\ 051,68</math>          Interest paid = <math>2\ 786\ 830,20 - 630\ 051,68</math>  <math>= R2\ 156\ 778,52</math></p> <p><b>OR/OF</b></p> <p>Total paid = <math>11\ 058,85 \times 21 \times 12 = 2\ 786\ 830,20</math>          Loan Paid = <math>1\ 050\ 000 - 419\ 952,39 = 630\ 047,61</math>          Interest paid = <math>2\ 786\ 830,20 - 630\ 047,61</math>  <math>= R2\ 156\ 782,59</math></p> <p><b>OR/OF</b></p> <p>Interest paid  <math>= 11\ 058,85 \times 21 \times 12 - (1\ 050\ 000 - 419\ 948,32)</math>  <math>= 2\ 786\ 830,20 - 630\ 051,68</math>  <math>= R2\ 156\ 778,52</math></p>	<p>✓ <math>11\ 058,85 \times 21 \times 12</math>          ✓ <math>1\ 050\ 000 - \text{Balance Outstanding}</math>          ✓ answer (3)</p> <p><b>OR/OF</b></p> <p>✓ <math>11\ 058,85 \times 21 \times 12</math>          ✓ <math>1\ 050\ 000 - \text{Balance Outstanding}</math>          ✓ answer (3)</p> <p><b>OR/OF</b></p> <p>✓ <math>11\ 058,85 \times 21 \times 12</math>          ✓ <math>1\ 050\ 000 - \text{Balance Outstanding}</math>          ✓ answer (3)</p>
		<b>[16]</b>

**QUESTION/VRAAG 9**

<p>9.1</p> $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{2(x+h)^2 - 3(x+h) - (2x^2 - 3x)}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{2x^2 + 4xh + 2h^2 - 3x - 3h - 2x^2 + 3x}{h}$ $= \lim_{h \rightarrow 0} \frac{4xh + 2h^2 - 3h}{h}$ $= \lim_{h \rightarrow 0} \frac{h(4x + 2h - 3)}{h}$ $= \lim_{h \rightarrow 0} (4x + 2h - 3)$ $\therefore f'(x) = 4x - 3$	<ul style="list-style-type: none"> <li>✓ substitution</li> <li>✓ <math>2x^2 + 4xh + 2h^2 - 3x - 3h</math></li> <li>✓ <math>4xh + 2h^2 - 3h</math></li> <li>✓ factorisation</li> <li>✓ answer (5)</li> </ul>
<p><b>OR/OF</b></p> $f(x) = 2x^2 - 3x$ $f(x+h) = 2(x+h)^2 - 3(x+h)$ $f(x+h) = 2x^2 + 4xh + 2h^2 - 3x - 3h$ $f(x+h) - f(x) = 4xh + 2h^2 - 3h$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{4xh + 2h^2 - 3h}{h}$ $= \lim_{h \rightarrow 0} \frac{h(4x + 2h - 3)}{h}$ $= \lim_{h \rightarrow 0} (4x + 2h - 3)$ $\therefore f'(x) = 4x - 3$	<p><b>OR/OF</b></p> <ul style="list-style-type: none"> <li>✓ substitution</li> <li>✓ <math>2x^2 + 4xh + 2h^2 - 3x - 3h</math></li> <li>✓ <math>4xh + 2h^2 - 3h</math></li> <li>✓ factorisation</li> <li>✓ answer (5)</li> </ul>
<p>9.2.1</p> $y = 4x^5 - 6x^4 + 3x$ $\frac{dy}{dx} = 20x^4 - 24x^3 + 3$	<ul style="list-style-type: none"> <li>✓ <math>20x^4</math></li> <li>✓ <math>-24x^3</math></li> <li>✓ 3 (3)</li> </ul>

<p>9.2.2</p> $D_x \left[ \frac{-\sqrt[3]{x}}{2} + \left( \frac{1}{3x} \right)^2 \right]$ $D_x \left[ \frac{-x^{\frac{1}{3}}}{2} + \frac{x^{-2}}{9} \right]$ $D_x \left[ -\frac{1}{2}x^{\frac{1}{3}} + \frac{1}{9}x^{-2} \right]$ $= -\frac{1}{6}x^{-\frac{2}{3}} - \frac{2x^{-3}}{9}$ $= -\frac{1}{6x^{\frac{2}{3}}} - \frac{2}{9x^3}$	$\checkmark \frac{-x^{\frac{1}{3}}}{2} \quad \checkmark \frac{x^{-2}}{9}$ $\checkmark -\frac{1}{6}x^{-\frac{2}{3}} \quad \checkmark -\frac{2x^{-3}}{9}$	(4)
<b>[12]</b>		

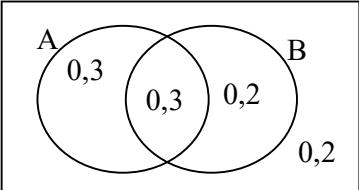
**QUESTION/VRAAG 10**

10.1	$h(x) = ax^3 + bx^2$ $h'(x) = 3ax^2 + 2bx$ $h'(4) = 0$ $48a + 8b = 0$ $6a + b = 0 \quad \dots(1)$ $h(4) = 32$ $64a + 16b = 32$ $4a + b = 2 \quad \dots(2)$ $(1) - (2): 6a + b = 0$ $4a + b = 2$ $2a = -2$ $a = -1$ $4(-1) + b = 2$ $b = 6$	✓ $h'(x)$ ✓ $h'(4) = 0$ ✓ $48a + 8b = 0$ or $6a + b = 0$  ✓ $h(4) = 32$ ✓ $64a + 16b = 32$ or $4a + b = 2$
10.2	$h(x) = -x^3 + 6x^2$ $-x^3 + 6x^2 = 0$ $x^2(-x + 6) = 0$ $x = 0 \quad \text{or} \quad x = 6$ $\therefore A(6; 0)$	✓ $-x^3 + 6x^2 = 0$ ✓ factors  ✓ $A(6; 0)$
10.3.1	$0 < x < 4 \quad \text{or} \quad 0 \leq x \leq 4$  <b>OR/OF</b>  $x \in (0; 4) \quad \text{or} \quad x \in [0; 4]$	✓ critical values ✓ notation
10.3.2	$x > 2$  <b>OR/OF</b>  $x \in (2; \infty)$	✓ 2 ✓ notation
10.4	$f(x) = h(x-1) = -(x-1)^3 + 6(x-1)^2$ $f(0) = 7$ $7 < k < 32 \quad \text{or} \quad k \in (7; 32)$	✓ $k < 32$ ✓ new $y$ -intercept = 7 ✓ $7 < k < 32$
		(3)
		[15]

**QUESTION/VRAAG 11**

11	$\text{Time} = \frac{20}{x}$ $\text{Cost} = (\text{water cost per hour} \times \text{time}) + (\text{kms} \times \text{R/km})$ $C(x) = 1,6 \times \left(\frac{20}{x}\right) + 20 \left(1,2 + \frac{x}{4000}\right)$ $C(x) = \frac{32}{x} + 24 + \frac{x}{200}$ $C'(x) = -\frac{32}{x^2} + \frac{1}{200} = 0$ $x^2 = 6400$ $x = 80 \text{ km/h}$	$\checkmark \frac{20}{x}$ $\checkmark 1,6 \times \left(\frac{20}{x}\right)$ $\checkmark 20 \left(1,2 + \frac{x}{4000}\right)$ $\checkmark C(x) = \frac{32}{x} + 24 + \frac{x}{200}$ $\checkmark C'(x) = -\frac{32}{x^2} + \frac{1}{200}$ $\checkmark C'(x) = 0$ $\checkmark \text{answer (A)}$	(7)
			[7]

**QUESTION/VRAAG 12**

12.1.1	No, because $P(A \text{ and } B) \neq 0$	$\checkmark \text{ answer and reason}$	(1)
12.1.2(a)	$P(A \text{ and } B) = 0,3$ $P(\text{only } B) = 0,2$ $P(A \text{ and } B) = P(A) \times P(B)$ $0,3 = P(A) \times 0,5$ $P(A) = 0,6$ $P(\text{only } A) = 0,3$	$\checkmark P(A \text{ and } B) = P(A) \times P(B)$ $\checkmark 0,5$ $\checkmark P(A) = 0,6$ $\checkmark \text{answer}$	(4)
12.1.2(b)	 $P(\text{not } A \text{ or not } B) = 0,2 + 0,2 + 0,3 = 0,7$ <b>OR/OF</b> $P(\text{not } A \text{ or not } B) = 1 - P(A \text{ and } B) = 1 - 0,3 = 0,7$ <b>OR/OF</b> $P(A' \text{ or } B') = P(A') + P(B') - P(A' \text{ and } B')$ $= 0,4 + 0,5 - 0,2 = 0,7$	$\checkmark \text{method}$ $\checkmark \text{answer}$  <b>OR/OF</b> $\checkmark \text{method}$ $\checkmark \text{answer}$  <b>OR/OF</b> $\checkmark \text{method}$ $\checkmark \text{answer}$	(2)  (2)  (2)

12.2.1	$P(\text{novel}) = \frac{3}{12} = \frac{1}{4}$				✓ answer (1)								
12.2.2	$12! = 479\ 001\ 600$				✓✓ answer (2)								
12.2.3	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 5px; text-align: center;">5</td> <td style="padding: 5px; text-align: center;">3!</td> <td style="padding: 5px; text-align: center;">8!</td> <td style="padding: 5px; text-align: center;">4</td> </tr> <tr> <td style="padding: 5px; text-align: center;">(Poetry)</td> <td style="padding: 5px; text-align: center;">(Novels all together)</td> <td style="padding: 5px; text-align: center;">(Arrangements of rest of the books including the novels)</td> <td style="padding: 5px; text-align: center;">(Drama)</td> </tr> </table> <p style="margin-top: 10px;"> <math>P(\text{start with poetry, end with drama AND all novels together})</math>  <math>= \frac{5 \times 3! \times 8! \times 4}{12!}</math>  <math>= \frac{1}{99}</math> </p>				5	3!	8!	4	(Poetry)	(Novels all together)	(Arrangements of rest of the books including the novels)	(Drama)	✓ $5 \times 4$ ✓ $3! = 6$ ✓ $8!$
5	3!	8!	4										
(Poetry)	(Novels all together)	(Arrangements of rest of the books including the novels)	(Drama)										
					[14]								

TOTAL/TOTAAL: 150