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Basic Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE/
NASIONALE SENIOR
SERTIFIKAAT**

GRADE 12/GRAAD 12

MATHEMATICS P1/WISKUNDE VI

NOVEMBER 2022

MARKING GUIDELINES/NASIENRIGLYNE

MARKS/PUNTE: 150

**These marking guidelines consist of 21 pages.
*Hierdie nasienriglyne bestaan uit 21 bladsye.***

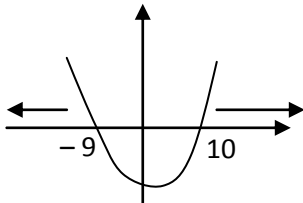
NOTE:

- 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 DEURGAANS op ALLE aspekte van die nasienriglyne van toepassing.

QUESTION1/VRAAG 1

1.1.1	$(3x - 6)(x + 2) = 0$ $x = 2$ or $x = -2$	$\checkmark x = 2$ $\checkmark x = -2$ (2)
1.1.2	$2x^2 - 6x + 1 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{6 \pm \sqrt{(-6)^2 - 4(2)(1)}}{2(2)}$ $x = 2,82$ or $x = 0,18$	\checkmark correct substitution into correct formula $\checkmark 2,82$ $\checkmark 0,18$ (3)
1.1.3	$x^2 - 90 > x$ $x^2 - x - 90 > 0$ $(x + 9)(x - 10) > 0$ CV: $x = -9$ or $x = 10$  $x < -9$ or $x > 10$ OR/OF $(-\infty; -9)$ or $(10; \infty)$	\checkmark standard form \checkmark critical values $\checkmark \checkmark x < -9$ or $x > 10$ (4)

1.1.4	$x - 7\sqrt{x} = -12$ $x + 12 = 7\sqrt{x}$ $(x + 12)^2 = (7\sqrt{x})^2$ $x^2 + 24x + 144 = 49x$ $x^2 - 25x + 144 = 0$ $(x - 16)(x - 9) = 0$ $x = 16$ or $x = 9$ OR/OF $x - 7\sqrt{x} + 12 = 0$ $(\sqrt{x} - 3)(\sqrt{x} - 4) = 0$ or let $\sqrt{x} = k$ $\sqrt{x} = 3$ or $\sqrt{x} = 4$ $x = 9$ or $x = 16$	✓ isolating the root ✓ squaring both sides ✓ standard form ✓ both answers (4) OR/OF ✓ standard form ✓ factors ✓ answers ✓ both answers for x (4)
1.2	$2x - y = 2$ $y = 2x - 2$ (1) $xy = 4$ (2) (1) in (2): $x(2x - 2) = 4$ $2x^2 - 2x - 4 = 0$ $x^2 - x - 2 = 0$ $(x - 2)(x + 1) = 0$ $x = 2$ or $x = -1$ $y = 2$ $y = -4$	✓ eq 1 ✓ substitution ✓ standard form ✓ x-values ✓ y-values (5)

	<p>OR/OF</p> $2x - y = 2$ $x = \frac{1}{2}y + 1 \quad \dots\dots\dots(1)$ $xy = 4 \quad \dots\dots\dots(2)$ <p>(1) in (2):</p> $y\left(\frac{1}{2}y + 1\right) = 4$ $\frac{1}{2}y^2 + y - 4 = 0$ $y^2 + 2y - 8 = 0$ $(y + 4)(y - 2) = 0$ $y = -4 \quad \text{or} \quad y = 2$ $x = -1 \quad x = 2$ <p>OR/OF</p> $2x - y = 2 \quad \dots\dots\dots(1)$ $y = \frac{4}{x} \quad \dots\dots\dots(2)$ <p>(2) in (1):</p> $2x - \frac{4}{x} = 2$ $2x^2 - 2x - 4 = 0$ $x^2 - x - 2 = 0$ $(x - 2)(x + 1) = 0$ $x = 2 \quad \text{or} \quad x = -1$ $y = 2 \quad y = -4$	<p>OR/OF</p> <p>✓ eq 1</p> <p>✓ substitution</p> <p>✓ standard form</p> <p>✓ y-values</p> <p>✓ x-values (5)</p> <p>OR/OF</p> <p>✓ eq 2</p> <p>✓ substitution</p> <p>✓ standard form</p> <p>✓ x-values</p> <p>✓ y-values (5)</p>
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	<p>OR/OF</p> $2x - y = 2 \quad \dots\dots\dots(1)$ $x = \frac{4}{y} \quad \dots\dots\dots(2)$ <p>(2) in (1):</p> $2\left(\frac{4}{y}\right) - y = 2$ $8 - y^2 - 2y = 0$ $y^2 + 2y - 8 = 0$ $(y + 4)(y - 2) = 0$ $y = -4 \quad \text{or} \quad y = 2$ $x = -1 \quad x = 2$	<p>OR/OF</p> <p>✓ eq 2</p> <p>✓ substitution</p> <p>✓ standard form</p> <p>✓ y-values</p> <p>✓ x-values (5)</p>
1.3	$2.5^n - 5^{n+1} + 5^{n+2} = 2.5^n - 5^n.5^1 + 5^n.5^2$ $= 5^n(2 - 5 + 25)$ $= 5^n(22)$ $2(5^n(11))$ <p>OR/OF</p> <p>Any integer multiplied by an even number will be even</p>	<p>✓ exp law</p> <p>✓ common factor</p> <p>✓ answer/explanation (3)</p>
1.4	$\frac{3^{y+1}}{32} = \sqrt{96^x}$ $\frac{3^{y+1}}{2^5} = (96)^{\frac{x}{2}}$ $3^{y+1}.2^{-5} = 2^{\frac{5x}{2}}.3^{\frac{x}{2}}$ $-5 = \frac{5x}{2}$ $\therefore x = -2$ $y + 1 = \frac{x}{2}$ $y + 1 = \frac{-2}{2}$ $\therefore y = -2$	<p>✓ $\frac{3^{y+1}}{2^5} = (96)^{\frac{x}{2}}$</p> <p>✓ $3^{y+1}.2^{-5} = 2^{\frac{5x}{2}}.3^{\frac{x}{2}}$</p> <p>✓ $x = -2$</p> <p>✓ $y = -2$ (4)</p>

	OR/OF $\frac{3^{y+1}}{32} = \sqrt{96^x}$ $\left(\frac{3^{y+1}}{2^5}\right)^2 = \left(\sqrt{(96)^x}\right)^2$ $\frac{3^{2y+2}}{2^{10}} = 2^{5x} \cdot 3^x$ $3^{2y+2} \cdot 2^{-10} = 2^{5x} \cdot 3^x$ $-10 = 5x$ $\therefore x = -2$ $2y + 2 = -2$ $\therefore y = -2$	OR/OF $\checkmark \left(\frac{3^{y+1}}{2^5}\right)^2 = \left(\sqrt{(96)^x}\right)^2$ $\checkmark 3^{2y+2} \cdot 2^{-10} = 2^{5x} \cdot 3^x$ $\checkmark x = -2$ $\checkmark y = -2 \quad (4)$
		[25]

QUESTION 2/VRAAG 2

2.1.1	$a = 14$ $T_6 = 14r^5 = 448$ $r^5 = 32$ $\therefore r = 2$ <div style="border: 1px solid black; padding: 2px; display: inline-block; margin-left: 100px;">Answer only: full marks</div>	$\checkmark T_6 = 14r^5 = 448$ $\checkmark r = 2$ (2)
2.1.2	$T_n = 14(2)^{n-1}$ $S_n = \frac{14(2^6 - 1)}{2 - 1}$ $S_6 = 882$ $114\,674 - 882 = 113\,792$ $113\,792 = 896(2^n - 1)$ $128 = 2^n$ $n = 7$ OR/OF $S_n = \frac{a(r^n - 1)}{r - 1}$ $114\,674 = \frac{14(2^n - 1)}{2 - 1}$ $8\,191 = 2^n - 1$ $2^n = 8\,192$ $n = \log_2 8\,192$ $n = 13$ $\therefore 7$ more terms must be added to the first 6 terms.	\checkmark substitution into correct formula $\checkmark S_6 = 882$ $\checkmark 128 = 2^n$ $\checkmark 7$ (4) OR/OF \checkmark substitution into correct formula $\checkmark 2^n = 8\,192$ $\checkmark n = 13$ $\checkmark 7$ (4)
2.1.3	$r = \frac{1}{2}$ OR $448r^5 = 14$ $\therefore r = \frac{1}{2}$ $S_\infty = \frac{a}{1 - r}$ $S_\infty = \frac{448}{1 - \frac{1}{2}}$ $S_\infty = 896$	$\checkmark r = \frac{1}{2}$ \checkmark substitution \checkmark answer (3)

2.2	$\sum_{p=0}^k \left(\frac{1}{3}p + \frac{1}{6} \right) = 20 \frac{1}{6}$ $T_1 = \frac{1}{6} \quad T_2 = \frac{1}{3} + \frac{1}{6} = \frac{3}{6}$ $d = \frac{3}{6} - \frac{1}{6} = \frac{1}{3}$ $\frac{121}{6} = \frac{n}{2} \left[2 \left(\frac{1}{6} \right) + (n-1) \left(\frac{1}{3} \right) \right]$ $\frac{121}{3} = n \left[\frac{1}{3} + \frac{1}{3}n - \frac{1}{3} \right]$ $\frac{121}{3} = \frac{1}{3}n^2$ $121 = n^2$ $n = 11$ $\therefore k = 10$ <p>OR/OF</p> $\sum_{p=0}^k \left(\frac{1}{3}p + \frac{1}{6} \right) = 20 \frac{1}{6}$ $a = \frac{1}{6}$ $l = \frac{1}{3}k + \frac{1}{6}$ $n = k + 1$ $S_n = \frac{n}{2} [a + l]$ $\frac{121}{6} = \frac{k+1}{2} \left[\frac{1}{6} + \frac{1}{3}k + \frac{1}{6} \right]$ $\frac{121}{6} = \frac{k+1}{2} \left[\frac{1}{3}k + \frac{1}{3} \right]$ $\frac{121}{6} = \frac{k+1}{2} \left[\frac{k+1}{3} \right]$ $\frac{121}{6} = \frac{(k+1)^2}{6}$ $k+1 = \pm \sqrt{121}$ $k+1 = 11$ $k = 10$	$\checkmark T_1 = \frac{1}{6}$ $\checkmark d$ $\checkmark \text{ substitution}$ $\checkmark \text{ value of } n$ $\checkmark \text{ value of } k \quad (5)$ <p>OR/OF</p> $\checkmark a = \frac{1}{6}$ $\checkmark l$ $\checkmark n = k + 1$ $\checkmark \frac{121}{6} = \frac{(k+1)^2}{6}$ $\checkmark \text{ value of } k \quad (5)$
		[14]

QUESTION 3/VRAAG 3

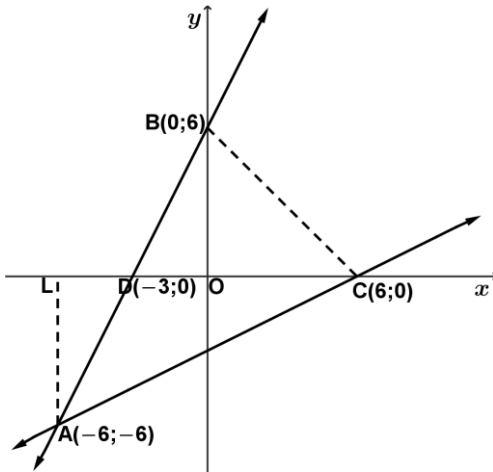
3.1	$3a + b = 7$ $3 + b = 7$ $b = 4$ OR/OF $T_2 - T_1 = 7$ $4 + 2b + 9 - (1 + b + 9) = 7$ $b = 4$	$\checkmark 3a + b = 7$ $\checkmark 3 + b = 7$ (2) OR/OF $\checkmark T_2 - T_1 = 7$ \checkmark substitution (2)
3.2	$T_n = n^2 + 4n + 9$ $T_{60} = (60)^2 + 4(60) + 9$ $= 3849$ <div style="border: 1px solid black; padding: 2px; display: inline-block;">Answer only: full marks</div>	\checkmark substitution \checkmark answer (2)
3.3	14 ; 21 ; 30 ; 41; First difference: 7 ; 9 ; 11 ; ... Common 2 nd difference: 2 $T_p = 2p + 5$ <div style="border: 1px solid black; padding: 2px; display: inline-block;">Answer only: full marks</div> OR/OF First difference: 7 ; 9 ; 11 ; ... $T_n = a + (n-1)d$ $T_p = 7 + (p-1)(2)$ $T_p = 2p + 5$	\checkmark first difference $\checkmark 2$ $\checkmark 2p + 5$ (3) OR/OF \checkmark first difference $\checkmark 2$ $\checkmark 2p + 5$ (3)
3.4	$157 = 2p + 5$ $p = 76$ \therefore Between T_{76} and T_{77} OR/OF $T_{n+1} - T_n = 157$ $(n+1)^2 + 4(n+1) + 9 - (n^2 + 4n + 9) = 157$ $n^2 + 2n + 1 + 4n + 4 + 9 - n^2 - 4n - 9 = 157$ $2n = 152$ $n = 76$ \therefore Between T_{76} and T_{77}	$\checkmark 157 = 2p + 5$ $\checkmark p = 76$ $\checkmark T_{76}$ and T_{77} (3) OR/OF $\checkmark T_{n+1} - T_n = 157$ $\checkmark n = 76$ $\checkmark T_{76}$ and T_{77} (3)
		[10]

QUESTION 4/VRAAG 4

4.1.1	$p = -1$ and $q = 2$	✓ $p = -1$ ✓ $q = 2$ (2)
4.1.2	$\frac{1}{x-1} + 2 = 0$ $-2x + 2 = 1$ $x = \frac{1}{2}$ $\left(\frac{1}{2}; 0\right)$	✓ = 0 ✓ answer (2)
4.1.3	$x = \frac{1}{2} - 3$ $= \frac{-5}{2}$ <div style="border: 1px solid black; padding: 2px; display: inline-block;">Answer only: full marks</div>	✓ -3 ✓ $x = \frac{-5}{2}$ (2)
4.1.4	$y = x + t$ $2 = 1 + t$ $t = 1$	✓ subst (1 ; 2) ✓ $t = 1$ (2)
4.1.5	$-2 \leq \frac{1}{x-1}$ <div style="border: 1px solid black; padding: 2px; display: inline-block;">Answer only: full marks</div> $\frac{1}{x-1} + 2 \geq 0$ $\therefore x \leq \frac{1}{2} \text{ or } x > 1$ OR/OF $x \in \left(-\infty; \frac{1}{2}\right] \text{ or } (1; \infty)$	✓ $\frac{1}{x-1} + 2 \geq 0$ ✓ $x \leq \frac{1}{2}$ ✓ $x > 1$ (3)
4.2.1	$y = -5$	✓ answer (1)
4.2.2	$x = \frac{-b}{2a} = \frac{-(-4)}{2(1)} = 2$ $f(2) = 2^2 - 4(2) - 5 = -9$ $\therefore D(2; -9)$ OR/OF $f'(x) = 2x - 4$ $2x - 4 = 0$ $x = 2$ $f(2) = 2^2 - 4(2) - 5 = -9$ $\therefore D(2; -9)$	✓ $x = 2$ ✓ $y = -9$ (2) OR/OF ✓ $x = 2$ ✓ $y = -9$ (2)

4.2.3	$q = -5$ $-9 = a(2)^2 - 5$ $-4 = 4a$ $a = -1$ $\therefore g(x) = -2^x - 5$	$\checkmark q = -5$ \checkmark substitution of $(2; -9)$ $\checkmark a = -1$ <div style="text-align: right;">(3)</div>
4.2.4	$y \in (-\infty; -5)$ OR $y < -5; y \in R$	\checkmark answer <div style="text-align: right;">(1)</div>
4.2.5	$k < -9$	$\checkmark -9$ $\checkmark k < -9$ <div style="text-align: right;">(2)</div>
		[20]

QUESTION 5/VRAAG 5

5.1	$g(x) = 2x + 6$ $y = 6$	✓ $y = 6$ (1)
5.2	$y = 2x + 6$ $x = 2y + 6$ $y = \frac{1}{2}x - 3$ <div style="border: 1px solid black; padding: 5px; display: inline-block; margin-top: 10px;">Answer only: Full marks</div>	✓ swop x and y ✓ equation (2)
5.3	$\frac{1}{2}x - 3 = 2x + 6$ $x - 6 = 4x + 12$ $3x = -18$ $x = -6$ $A(-6; -6)$ OR/OF $2x + 6 = x$ $x = -6$ $y = -6$	✓ equating ✓ $x = -6$ ✓ $y = -6$ (3) OR/OF ✓ equating ✓ $x = -6$ ✓ $y = -6$ (3)
5.4	$AB = \sqrt{(6)^2 + (12)^2}$ $= \sqrt{180} = 6\sqrt{5} = 13,42$	✓ substitution ✓ answer (2)
		

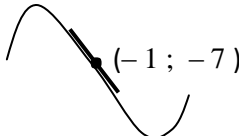

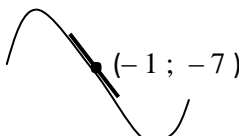

5.5	$BC = \sqrt{6^2 + 6^2} = \sqrt{72} = 6\sqrt{2}$ $AB = AC = \sqrt{180} \quad \text{symmetry of } g \text{ and } g^{-1}$ $\perp h = (\sqrt{180})^2 - \left(\frac{\sqrt{72}}{2}\right)^2$ $= \sqrt{162} = 9\sqrt{2}$ $\text{area of } \triangle ABC = \frac{1}{2} BC \times h$ $= \frac{1}{2} \times \sqrt{72} \times \sqrt{162} = 54 \text{ units}^2$ <p>OR/OF</p> $\tan \hat{BDC} = 2$ $\therefore \hat{BDC} = 63,43^\circ$ $\tan \hat{DCA} = \frac{1}{2}$ $\therefore \hat{DCA} = 26,57^\circ$ $\therefore \hat{DAC} = 36,86^\circ \quad (\text{ext angle triangle})$ $\text{Area of } \triangle ABC = \frac{1}{2} (\sqrt{180}) (\sqrt{180}) \sin 36,86^\circ$ $= 53,99 \text{ units}^2$ <p>OR/OF</p> $\text{Area of } \triangle ABC = \text{Area of } \triangle BDC + \text{Area of } \triangle ADC$ $= \frac{1}{2} DC \cdot BO + \frac{1}{2} DC \cdot \text{height}$ $= \frac{1}{2} (9)(6) + \frac{1}{2} (9)(6)$ $= 54 \text{ units}^2$	\checkmark BC \checkmark AB = AC /midpoint (3 ; 3) \checkmark $\perp h$ (A) \checkmark substitution \checkmark answer (A) (5) <p>OR/OF</p> \checkmark $\hat{BDC} = 63,43^\circ$ \checkmark $\hat{DAC} = 36,86^\circ$ \checkmark AC = $\sqrt{180}$ \checkmark substitution into the correct formula \checkmark answer (A) (5) <p>OR/OF</p> \checkmark Areas ($\triangle BDC + \triangle ADC$) \checkmark $\frac{1}{2} DC \cdot BO$ \checkmark $\frac{1}{2} DC \cdot \text{height}$ \checkmark substitution \checkmark answer (A) (5)
		[13]

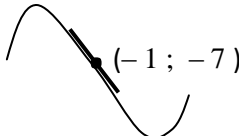

QUESTION 6/VRAAG 6

6.1	$A = P(1+i)^n$ $13\,459 = 12\,000\left(1 + \frac{m}{400}\right)^8$ $\left(1 + \frac{m}{400}\right)^8 = 1,121\dots$ $1 + \frac{m}{400} = \sqrt[8]{1,121\dots}$ $\frac{m}{400} = 0,0144\dots$ $\therefore m = 5,78\%$	✓ 8 ✓ subst into correct formula ✓ $1 + \frac{m}{400} = \sqrt[8]{1,121\dots}$ ✓ 5,78 % (4)
6.2	$F = \frac{x[(1+i)^n - 1]}{i}$ $F = \frac{1\,000\left[\left(1 + \frac{0,075}{12}\right)^{12} - 1\right]}{\frac{0,075}{12}}$ $= R12\,421,22$ <p>He won't be able to buy the computer because $R13\,000 - R12\,421,22 = R578,78$ OR/OF He won't be able to buy the computer because $R12\,421,22 < R13\,000$</p>	✓ $\frac{0,075}{12}$ ✓ 12 ✓ answer ✓ conclusion (4)
6.3.1	Loan amount = $85\% \times R250\,000$ $= R212\,500$ OR/OF Loan amount = $R250\,000 - (15\% \times R250\,000)$ $= R212\,500$	✓ answer (1) OR/OF ✓ answer (1)
6.3.2	$A = 212\,500\left(1 + \frac{0,13}{12}\right)^5$ $A = 224\,262,53$ $P = \frac{x[1 - (1+i)^{-n}]}{i}$ $224\,262,53 = \frac{x\left[1 - \left(1 + \frac{0,13}{12}\right)^{-67}\right]}{\frac{0,13}{12}}$ $\therefore x = R4\,724,96$	✓ $A = 212\,500\left(1 + \frac{0,13}{12}\right)^5$ ✓ answer ✓ substitution into correct formula ✓ - 67 ✓ answer (5)
		[14]

QUESTION 7/VRAAG 7

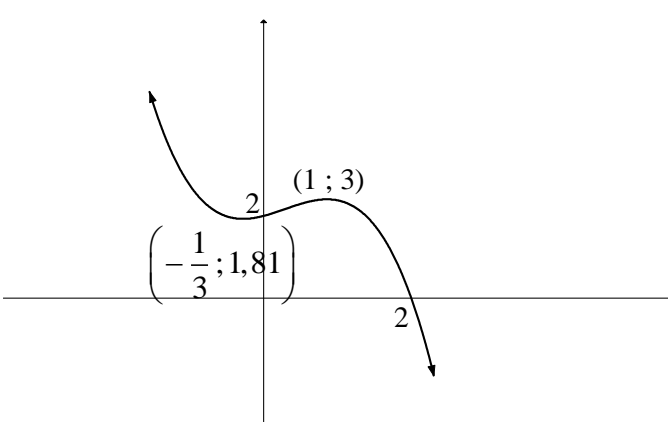
7.1	$f(x) = x^2 + x$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{(x+h)^2 + (x+h) - (x^2 + x)}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{x^2 + 2xh + h^2 + x + h - x^2 - x}{h}$ $= \lim_{h \rightarrow 0} \frac{2xh + h^2 + h}{h}$ $= \lim_{h \rightarrow 0} \frac{h(2x + h + 1)}{h}$ $\therefore f'(x) = 2x + 1$ <p>OR/OF</p> $f(x) = x^2 + x$ $f(x+h) = (x+h)^2 + (x+h) = x^2 + 2xh + h^2 + x + h$ $f(x+h) - f(x) = x^2 + 2xh + h^2 + x + h - x^2 - x$ $= 2xh + h^2 + h$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{2xh + h^2 + h}{h}$ $= \lim_{h \rightarrow 0} \frac{h(2x + h + 1)}{h}$ $\therefore f'(x) = 2x + 1$	<p>✓ substitution into the formula</p> <p>✓ $x^2 + 2xh + h^2 + x + h$</p> <p>✓ $2xh + h^2 + h$</p> <p>✓ common factor</p> <p>✓ answer (5)</p> <p>OR/OF</p> <p>✓ $x^2 + 2xh + h^2 + x + h$</p> <p>✓ $2xh + h^2 + h$</p> <p>✓ substitution into the formula</p> <p>✓ common factor</p> <p>✓ answer (5)</p>
7.2	$f(x) = 2x^5 - 3x^4 + 8x$ $f'(x) = 10x^4 - 12x^3 + 8$	<p>✓ $10x^4$</p> <p>✓ $-12x^3$</p> <p>✓ 8 (3)</p>
7.3	$g(x) = ax^3 + 3x^2 + bx + c$ $g'(x) = 3ax^2 + 6x + b$ $g''(x) = 6ax + 6$ $g''(-1) = 6a(-1) + 6 = 0$ $\therefore a = 1$ <p>For concave up $g''(x) > 0$</p> $6x + 6 > 0$ $x > -1$	<p>✓ $g'(x) = 3ax^2 + 6x + b$</p> <p>✓</p> <p>$g''(-1) = 6a(-1) + 6 = 0$</p> <p>✓ $a = 1$</p> <p>✓ $x > -1$ (4)</p>

	<p>OR/OF Min gradient at $(-1; -7)$ implies: at $x = -1$ - point of inflection and g will be positive cubic hence $a > 0$</p> <p>Since g is concave up $x > -1$</p> <p>OR/OF</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>$(-1; -7)$</p> <p>Since g is concave up $x > -1$</p> </div> <div style="text-align: center;">  <p>$(-1; y)$</p> <p>Since g is concave up $x > -1$</p> </div> </div> <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;"> Answer only: $\frac{1}{4}$ </div>	
	<p>OR/OF Min gradient at $(-1; -7)$ implies: at $x = -1$ - point of inflection and g will be positive cubic hence $a > 0$</p> <p>Since g is concave up $x > -1$</p> <p>OR/OF</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>$(-1; -7)$</p> <p>Since g is concave up $x > -1$</p> </div> <div style="text-align: center;">  <p>$(-1; y)$</p> <p>Since g is concave up $x > -1$</p> </div> </div> <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;"> Answer only: $\frac{1}{4}$ </div>	

	<p>OR/OF Min gradient at $(-1; -7)$ implies: at $x = -1$ - point of inflection and g will be positive cubic hence $a > 0$</p> <p>Since g is concave up $x > -1$</p> <p>OR/OF</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>$(-1; -7)$</p> <p>Since g is concave up $x > -1$</p> </div> <div style="text-align: center;">  <p>$(-1; y)$</p> <p>Since g is concave up $x > -1$</p> </div> </div> <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;"> Answer only: $\frac{1}{4}$ </div>	<p>OR/OF</p> <p>✓ point of inflection ✓✓ $a > 0$</p> <p>✓ $x > -1$ (4)</p> <p>OR/OF</p> <p>✓✓ pos graph ✓ point of inflection</p> <p>✓ $x > -1$ (4)</p>
		[12]

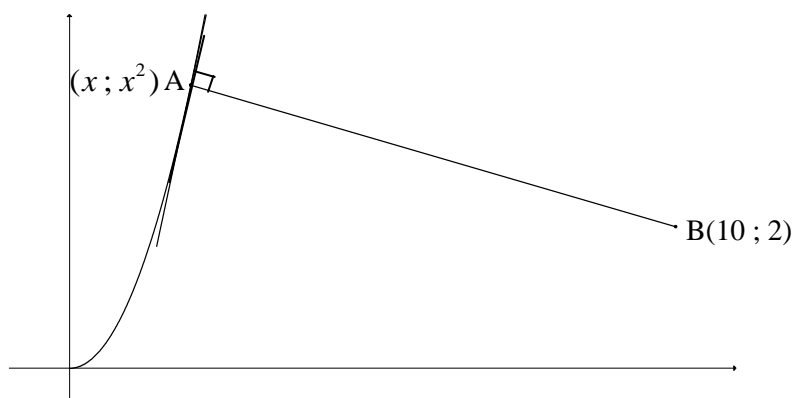
QUESTION 8/VRAAG 8

8.1	$f'(x) = mx^2 + nx + k$ $f'(x) = m\left(x + \frac{1}{3}\right)(x-1)$ $1 = m\left(0 + \frac{1}{3}\right)(0-1)$ $1 = -\frac{1}{3}m$ $\therefore m = -3$ $f'(x) = -3\left(x + \frac{1}{3}\right)(x-1)$ $f'(x) = -3\left(x^2 - \frac{2}{3}x - \frac{1}{3}\right)$ $f'(x) = -3x^2 + 2x + 1$ $\therefore n = 2$ $\therefore k = 1$ <p>OR/OF</p> $k = 1$ $0 = m + n + 1 \quad \text{and} \quad \frac{1}{9}m - \frac{1}{3}n + 1 = 0$ $m + n = -1 \quad (1)$ $m - 3n = -9 \quad (2)$ $(1) - (2)$ $4n = 8$ $\therefore n = 2$ $m + 2 = -1$ $\therefore m = -3$	$\checkmark \text{ substitution of } \left(-\frac{1}{3}; 0\right)$ $\text{and } (1; 0)$ $\checkmark \text{ substitution of } (0; 1)$ $\checkmark m = -3$ $\checkmark f'(x) = -3\left(x^2 - \frac{2}{3}x - \frac{1}{3}\right)$ $\checkmark n = 2$ $\checkmark k = 1 \quad (6)$ <p>OR/OF</p> $\checkmark k = 1$ $\checkmark m + n = -1$ $\checkmark m - 3n = -9$ $\checkmark 4n = 8$ $\checkmark n = 2$ $\checkmark m = -3 \quad (6)$
8.2.1	$f(x) = -x^3 + x^2 + x + 2$ $f\left(-\frac{1}{3}\right) = \frac{49}{27} = 1,81$ $\text{T.P}\left(-\frac{1}{3}; \frac{49}{27}\right)$ $f(1) = 3$ $\text{T.P}(1; 3)$	$\checkmark x\text{-coordinates of the TP}$ $\checkmark \text{T.P}\left(-\frac{1}{3}; \frac{49}{27}\right)$ $\checkmark \text{T.P}(1; 3) \quad (3)$

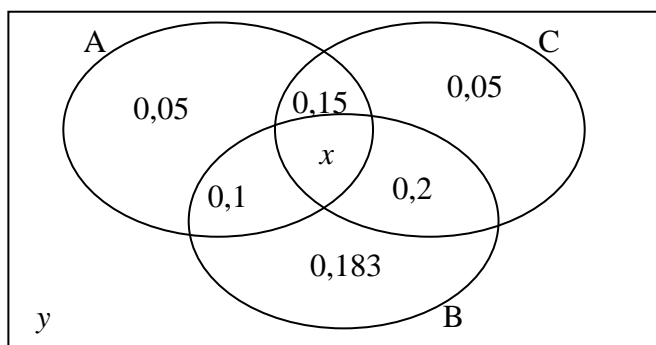
8.2.2	$f(x) = -x^3 + x^2 + x + 2$ $-x^3 + x^2 + x + 2 = 0$ $(x-2)(-x^2 - x - 1) = 0$ $x = 2 \text{ or no solution}$ 	$\checkmark x = 2$ \checkmark one x -intercept \checkmark two turning points \checkmark y -intercept \checkmark shape: neg cubic <div style="text-align: right;">(5)</div>
8.3.1	$a = \frac{-\frac{1}{3} + 1}{2}$ $= \frac{1}{3}$ <p>OR/OF</p> $f'(x) = -3x^2 + 2x + 1$ $f''(x) = -6x + 2$ $f''(a) = -6a + 2 = 0$ $-6a = -2$ $a = \frac{1}{3}$	\checkmark answer (1) <p>OR/OF</p> \checkmark answer (1)
8.3.2	$b < \frac{4}{3} \text{ units}$	$\checkmark \frac{4}{3}$ $\checkmark b < \frac{4}{3}$ (2)
		[17]

QUESTION9/VRAAG 9

9.1	<p>Any point on $f : (x; x^2)$</p> <p>distance $= \sqrt{(x-10)^2 + (x^2-2)^2}$</p> <p>$= \sqrt{x^2 - 20x + 100 + x^4 - 4x^2 + 4}$</p> <p>$= \sqrt{x^4 - 3x^2 - 20x + 104}$</p> <p>For min distance</p> <p>$\frac{d}{dx}(x^4 - 3x^2 - 20x + 104) = 0$</p> <p>$4x^3 - 6x - 20 = 0$</p> <p>$(x-2)(4x^2 + 8x + 10) = 0$</p> <p>$\Delta = 8^2 - 4(4)(10) = -96 \quad \therefore \text{no roots}$</p> <p>$\therefore x = 2$</p> <p>$d = \sqrt{2^4 - 3(2)^2 - 20(2) + 104} = 2\sqrt{17} = 8,25$</p>	<p>✓ $(x; x^2)$</p> <p>✓ substitution</p> <p>✓ simplification</p> <p>✓ answer</p> <p>✓ $4x^3 - 6x - 20$</p> <p>✓ derivative = 0</p> <p>✓ $x = 2$</p> <p>✓ answer (A) (8)</p>
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9.2	<p>$m_{AB} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{x^2 - 2}{x - 10}$</p> <p>$\therefore m_{\text{tang}} = -\frac{x-10}{x^2-2}$</p> <p>$f'(x) = 2x$</p> <p>$\therefore 2x = -\frac{x-10}{x^2-2}$</p> <p>$-2x^3 + 4x = x - 10$</p> <p>$2x^3 - 3x - 10 = 0$</p> <p>$x = 2$</p> <p>$y = (2)^2 = 4$</p> <p>$\therefore AB = \sqrt{(2-10)^2 + (4-2)^2}$</p> <p>$= 2\sqrt{17} = 8,25$</p>	<p>✓ m_{AB}</p> <p>✓ $m_{\text{tang}} = -\frac{x-10}{x^2-2}$</p> <p>✓ $f'(x) = 2x$</p> <p>✓ equating</p> <p>✓ standard form</p> <p>✓ $x = 2$</p> <p>✓ substitute into distance</p> <p>✓ answer (A) (8)</p>
[8]		

QUESTION 10/VRAAG 10

10.1.1(a)	$y = 1 - 0,893 = 0,107$ (0,11)	✓ $y = 1 - 0,893$ (1)
10.1.1(b)	$x = 0,893 - 0,733$ $= 0,16$	✓ $x = 0,893 - 0,733$ (1)
10.1.2	$P(\text{at least 2 events}) = 0,1 + 0,15 + 0,16 + 0,2$ $= 0,61$ <div style="border: 1px solid black; padding: 2px; display: inline-block;">Answer only: Full Marks</div>	✓ values ✓ answer (2)
10.1.3	$P(B) = 0,643$ $P(C) = 0,56$ $P(B \text{ and } C) = 0,36$ $P(B) \times P(C) = 0,643 \times 0,56 = 0,36$ $\therefore P(B \text{ and } C) = P(B) \times P(C)$ $\therefore B \text{ and } C \text{ are independent}$	✓ $P(B) = 0,643$ ✓ $P(C) = 0,56$ ✓ $P(B \text{ and } C) = 0,36$ ✓ $P(B) \times P(C) = 0,36$ ✓ independent because $P(B \text{ and } C) = P(B) \times P(C)$ (5)
10.2.1	$7 \times 6 \times 5 \times 4 = 840$	✓ 4×7 ✓ $7 \times 6 \times 5 \times 4 = 840$ (3)
10.2.2	start with 5, 7, 9 or start with 6 or start with 8 $(3 \times 5 \times 1 \times 3) + (1 \times 5 \times 1 \times 2) + (1 \times 5 \times 1 \times 2)$ $= 45 + 10 + 10$ $= 65$ $P = \frac{65}{840} = \frac{13}{168} = 0,08$ OR/OF ends in 4 or ends in 6 or ends in 8 $(5 \times 5 \times 1 \times 1) + (4 \times 5 \times 1 \times 1) + (4 \times 5 \times 1 \times 1)$ $= 25 + 20 + 20$ $= 65$ $P = \frac{65}{840} = \frac{13}{168} = 0,08$	✓ $(3 \times 5 \times 1 \times 3) = 45$ ✓ $(1 \times 5 \times 1 \times 2) = 10$ ✓ $(1 \times 5 \times 1 \times 2) = 10$ ✓ 65 ✓ answer (5) OR/OF ✓ $(5 \times 5 \times 1 \times 1) = 25$ ✓ $(4 \times 5 \times 1 \times 1) = 20$ ✓ $(4 \times 5 \times 1 \times 1) = 20$ ✓ 65 ✓ answer (5)
		[17]

TOTAL/TOTAAL: 150