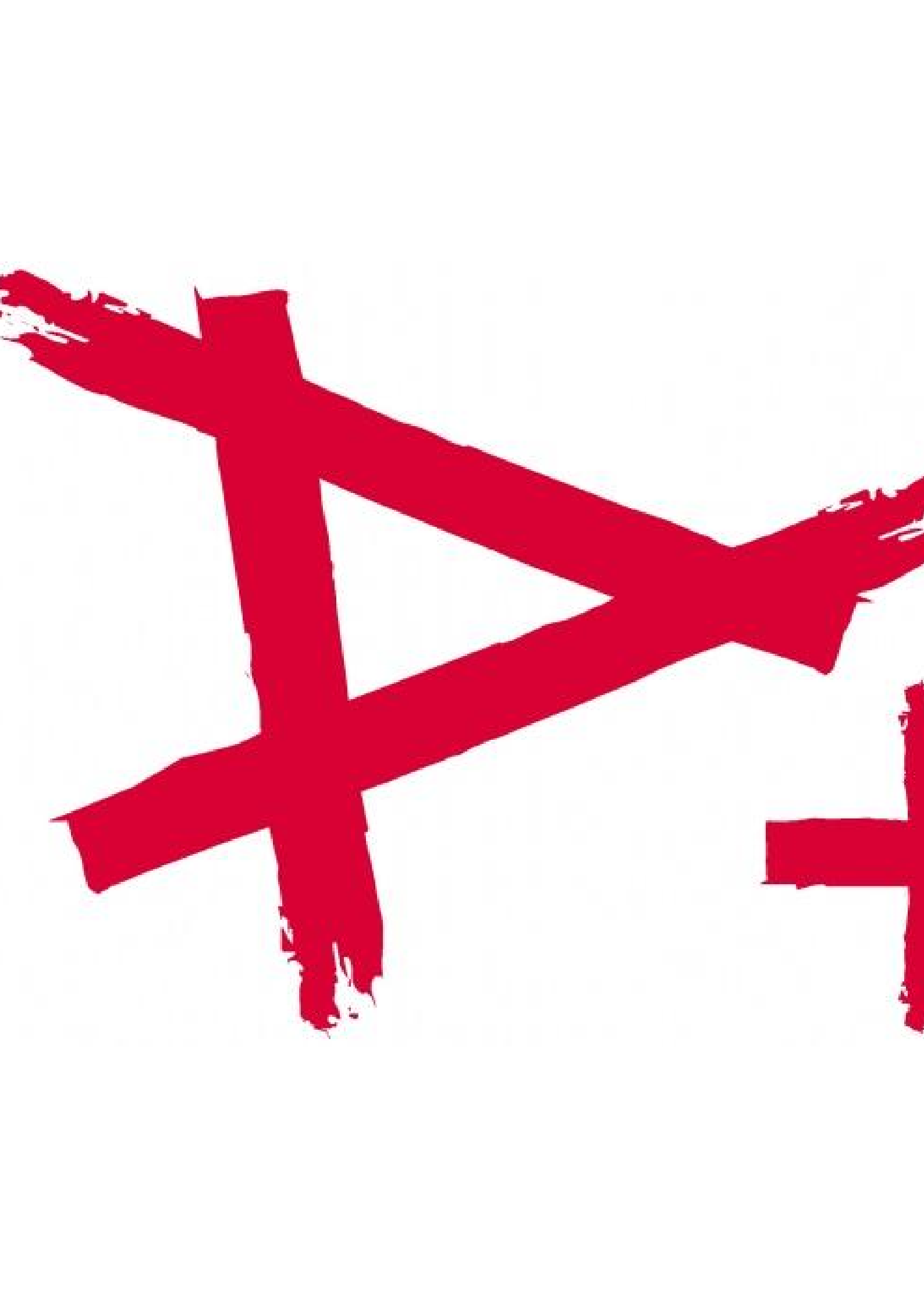
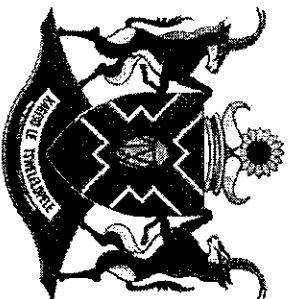






Education and Sport Development

Department of Education and Sport Development
Departement van Onderwys en Sportontwikkeling
Lefapha la Thuto le Tlhabololo ya Metsameko

NORTH WEST PROVINCE

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

**MATHEMATICS P1
MEMORANDUM
SEPTEMBER 2016**

MARKS: 150

This memorandum consists of 20 pages.

NOTE:

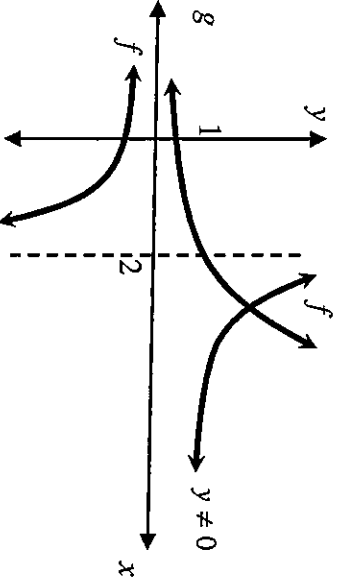
- If a candidate answered a question TWICE, only mark the FIRST attempt.
- Consistent accuracy applies in ALL aspects of the marking memorandum.

QUESTION 1

1.1.1	$7x(2x - 1) = 0$ $7x = 0$ or $2x - 1 = 0$ $x = 0$ $2x = 1$ $x = \frac{1}{2}$	$\checkmark x = 0$ $\checkmark x = \frac{1}{2}$	(2)
1.1.2	$2x^2 + x = 4$ $2x^2 + x - 4 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-1 \pm \sqrt{1^2 - 4(2)(-4)}}{2(2)}$ $= \frac{-1 \pm \sqrt{33}}{4}$ $x = 1,19$ or $x = -1,69$	$\checkmark$ standard form $\checkmark$ substitution into the correct formula	(4)
1.1.3	$(x - 4)(x + 5) \geq 0$ $\therefore x \leq -5$ or $x \geq 4$	$\checkmark x \leq -5$ $\checkmark x \geq 4$ $\checkmark$ or	(3)
	OR  OR $\frac{-5}{+} \quad \frac{4}{-} \quad \frac{+}{+}$ $(-\infty; -5] \cup [4; \infty)$	$\checkmark x \in (-\infty; -5]$ $\checkmark x \in [4; \infty)$ $\checkmark$ or	(3)

1.1.4	$3x^{\frac{2}{5}} - 5x^{\frac{1}{5}} - 2 = 0$ Let $x^{\frac{1}{5}} = k$ $\therefore 3k^2 - 5k - 2 = 0$ $(3k + 1)(k - 2) = 0$ $3k = -1 \quad \text{or} \quad k = 2$ $k = -\frac{1}{3}$ $x^{\frac{1}{5}} = -\frac{1}{3} \quad \text{or} \quad x^{\frac{1}{5}} = 2$ $x = \left(-\frac{1}{3}\right)^5 \quad x = 2^5$ $x = -\frac{1}{243} \quad x = 32$ OR $3x^{\frac{2}{5}} - 5x^{\frac{1}{5}} - 2 = 0$ $(3x^{\frac{1}{5}} + 1)(x^{\frac{1}{5}} - 2) = 0$ $3x^{\frac{1}{5}} = -1 \quad \text{or} \quad x^{\frac{1}{5}} = 2$ $x^{\frac{1}{5}} = -\frac{1}{3} \quad x = 2^5$ $x = \left(-\frac{1}{3}\right)^5 \quad x = 32$ $x = -\frac{1}{243}$	✓ factors ✓ $x^{\frac{1}{5}} = -\frac{1}{3}$ of $x^{\frac{1}{5}} = 2$ ✓ $x = -\frac{1}{243}$ ✓ $x = 32$ (4)
1.2	$\frac{2x}{1+y} = 1; y \neq -1 \text{ and } (3x - y)(x + y) = 0$ $2x = 1 + y$ $2x - 1 = y$ $(3x - y) = 0 \quad \text{or} \quad x + y = 0$ $3x - (2x - 1) = 0 \quad \text{or} \quad x + (2x - 1) = 0$ $x = -1 \quad \text{or} \quad 3x = 1$ $x = \frac{1}{3}$ $y = 2(-1) - 1 \quad \text{or} \quad y = 2\left(\frac{1}{3}\right) - 1$ $= -3 \quad = -\frac{1}{3}$ OR	✓ $2x - 1 = y$ ✓ two factors = 0 ✓ substitution ✓ both x-values ✓ y-values (6)

	$\frac{2x}{1+y} = 1; y \neq -1 \text{ and } (3x - y)(x + y) = 0$ $2x = 1 + y$ $2x - 1 = y$ $(3x - (2x - 1))(x + (2x - 1)) = 0$ $(x + 1)(3x - 1) = 0$ $x = -1 \quad \text{or} \quad 3x = 1$ $x = \frac{1}{3}$ $y = 2(-1) - 1 \quad \text{or} \quad y = 2\left(\frac{1}{3}\right) - 1$ $= -3 \qquad \qquad \qquad = -\frac{1}{3}$	✓ $2x - 1 = y$ ✓ substitution ✓ factors = 0 ✓ both x-values ✓ ✓ y-values (6)
	OR $\frac{2x}{1+y} = 1; y \neq -1 \text{ and } (3x - y)(x + y) = 0$ $2x = 1 + y$ $x = \frac{1+y}{2}$ $(3x - y) = 0 \quad \text{or} \quad (x + y) = 0$ $3\left(\frac{1+y}{2}\right) - y = 0 \qquad \frac{1+y}{2} + y = 0$ $3(1+y) = 2y \qquad \qquad 1+y = -2y$ $3+3y = 2y \qquad \qquad 3y = -1$ $y = -3 \qquad \qquad y = -\frac{1}{3}$ $x = \frac{1-3}{2} \quad \text{or} \quad x = \frac{1-\frac{1}{3}}{2}$ $x = -1 \qquad \qquad x = \frac{1}{3}$	✓ $x = \frac{1+y}{2}$ ✓ two factors = 0 ✓ substitution ✓ both y-values ✓ ✓ x-values (6)
1.3	$f(x)$ a hyperbola with asymptotes $y = 0$ and $x = 2$. Range of f: $y > 0$ ór $y < 0$. $g(x)$ is an increasing exponential function translated 2 units right, thus $y > 0$ for all $x \in \mathbb{R}$. Therefore f and g intersect only once.	✓ f is hyperbola; $y > 0$ ór $y < 0$ ✓ g: range of g: $y > 0$ (increasing exponential) ✓ explanation (3)

OR		✓ f: hyperbola sketch; ✓ g: sketch of g ✓ g: explanation: If $x < 2$: $g(x) > 0$, $f(x) < 0$ thus no root. If $x > 2$: $g(x) > 0$, $f(x) > 0$ thus one root only (3) [22]
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QUESTION 2

2.1.1	1 st differences: $2x$; $3x$; $4x$	✓ first 3 terms (1)
2.1.2	$T_{100} = 101x$	✓ $101x$ (1)
2.1.3	2 : 4 : 6 : 8 : 10 : 12 : 14 : 16 : 18 : 20 2a = 2 a = 1 $T_2 - T_1 = 3a + b$ $4 = 3(1) + b$ $b = 1$ $T_1 = a + b + c$ $2 = 1 + 1 + c$ $c = 0$ $\therefore T_n = n^2 + n$	✓ second difference = 2 ✓ $a = 1$ ✓ $b = 1$ ✓ $c = 0$ (4)
2.2.1	$\frac{T_2}{T_1} = \frac{T_3}{T_2}$ $\frac{x}{54} = \frac{6}{x}$ $x^2 = 324$ $x = \pm 18$	✓ $\frac{x}{54} = \frac{6}{x}$ ✓ $x = \pm 18$ (2)

2.2.2	$r = \frac{T_2}{T_1}$ $= \pm \frac{18}{54}$ $= \pm \frac{1}{3}$ $\therefore -1 < r < 1$ $\therefore$ converging sequence	✓ $r = \pm \frac{1}{3}$ ✓ $-1 < r < 1$ ✓ converging (3)
2.3	$11 + 14 + 17 + \dots = 4k$ $S_n = \frac{n}{2}[2a + (n-1)d]$ $4k = \frac{56}{2}[2(11) + (55)(3)]$ $4k = 5236$ $k = 1309$ OR $11 + 14 + 17 + \dots = 4k$ $S_n = \frac{n}{2}[a + l]$ $4k = \frac{56}{2}[11 + 176]$ $4k = 5236$ $k = 1309$	✓ $11 + 14 + 17 + \dots$ ✓ $S_n = 4k$ ✓ substitution into correct formula ✓ $n = 56$ ✓ answer (5)
2.4.1	$4; \frac{1}{36}$	✓ answer (1)

2.4.2	$4; 4; 4; \dots$ 13 terms $\frac{3}{4}; \frac{1}{4}; \frac{1}{12}; \dots$ 12 terms $S_{13} = 13(4)$ $= 52$ $S_{12} = \frac{a(1-r^n)}{1-r}$ $= \frac{3\left(1 - \left(\frac{1}{3}\right)^{12}\right)}{4\left(1 - \left(\frac{1}{3}\right)\right)}$ $= \frac{1 - \frac{1}{3}}{1 - \frac{1}{3}}$ $= 1, 12$ $S_{25} = S_{13} + S_{12}$ $= 52 + 1, 12$ $= 53, 12$	✓ $n = 13$ ✓ $S_{13} = 52$ ✓ $n = 12$ ✓ substitution into correct formula ✓ $S_{12} = 1, 12$ ✓ answer (6) [23]
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QUESTION 3

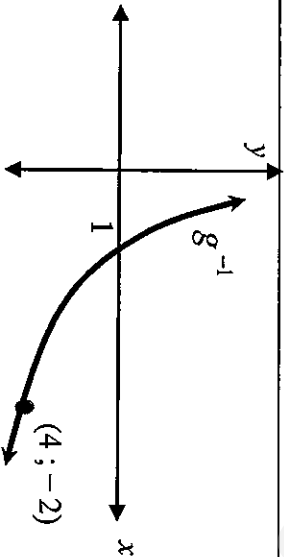
3.1	$y = \frac{-3}{0-2} + 1$ $= \frac{3}{2} + 1$ $= 2,5$ or $y = \frac{5}{2}$ $\therefore (0; 2,5)$ or $\left(0; \frac{5}{2}\right)$	✓ $x = 0$ ✓ $y = 2,5$ or $y = \frac{5}{2}$ (2)
3.2	$0 = \frac{-3}{x-2} + 1$ $-1 = \frac{-3}{x-2}$ $x - 2 = 3$ $x = 5$ $\therefore (5; 0)$	✓ $y = 0$ ✓ $x = 5$ (2)

3.3		✓ shape ✓ both intercepts ✓ both asymptotes	(3)
3.4	$y \in \mathbb{R}; y \neq 1$ OR $y < 1$ or $y > 1$ OR $y \in (-\infty; 1) \cup y \in (1; \infty)$	✓ $y \in \mathbb{R}$ ✓ $y \neq 1$ ✓ $y < 1$; ✓ $y > 1$ ✓ $y \in (-\infty; 1)$ ✓ $y \in (1; \infty)$	(2)
3.5	$h(x) = \frac{-3}{x-5} - 3$	✓ $\frac{-3}{x-5}$ ✓ -3	(2)
3.6	From the graph of h: $5 < x \leq 8$ or $x \in (5; 8]$	✓ (8; -4) ✓ $5 < x$ ✓ $x \leq 8$	(3)
	OR From translations: $h(x) \leq -4 \therefore f(x) \leq 0$ (4 units up) If $f(x) \leq 0$, then $2 < x \leq 5$ $\therefore$ for $h(x)$: 5 < x ≤ 8 (3 units to the right)	✓ $f(x) \leq 0$ ✓ $f(x)$: $2 < x \leq 5$ ✓ $h(x)$: $5 < x \leq 8$	(3)

3.7	$k(x) = \frac{3x - 5}{x - 1}$ By dividing $x - 1$ into $3x - 5$: $k(x) = \frac{-2}{x - 1} + 3$ ∴ The asymptotes are: $x = 1$ and $y = 3$ OR $k(x) = \frac{3x - 5}{x - 1}$ $k(x) = \frac{3(x - 1) - 2}{x - 1}$ $k(x) = 3 - \frac{2}{x - 1}$ ∴ The asymptotes are: $x = 1$ and $y = 3$	$✓ k(x) = \frac{-2}{x - 1} + 3$ $✓ x = 1$ $✓ y = 3$ (3)
		(3) [17]

QUESTION 4

4.1	$x = -1$	✓ $x = -1$	(1)
4.2	$(-1; -8)$	✓ answer	(1)
4.3	$2(x + 1)^2 - 8 = 0$ $2(x + 1)^2 = 8$ $(x + 1)^2 = 4$ $x + 1 = \pm 2$ $x = 1$ or $x = -3$ $\therefore PQ = 1 + 3 = 4$ units OR $2(x^2 + 2x + 1) - 8 = 0$ $2x^2 + 4x + 2 - 8 = 0$ $2x^2 + 4x - 6 = 0$ $x^2 + 2x - 3 = 0$ $(x + 3)(x - 1) = 0$ $x = 1$ or $x = -3$ $\therefore PQ = 1 + 3 = 4$ units	✓ $y = 0$ ✓ $(x + 1)^2 = 4$ ✓ $x + 1 = \pm 2$ ✓ $PQ = 4$ units ✓ $y = 0$ ✓ standard form ✓ factors ✓ $PQ = 4$ units	(4)

4.4	$k(x) = 2(-x + 1)^2 - 8$ $= 2(x^2 - 2x + 1) - 8$ $= 2x^2 - 4x + 2 - 8$ $= 2x^2 - 4x - 6$ OR $k(x) = 2(-x)^2 + 4(-x) - 6$ $= 2x^2 - 4x - 6$ OR $k(x) = 2(x - 1)^2 - 8$ $= 2(x^2 - 2x + 1) - 8$ $= 2x^2 - 4x + 2 - 8$ $= 2x^2 - 4x - 6$	✓ substituting x by $-x$ ✓ simplification $(x^2 - 2x + 1)$ ✓ answer $(2x^2 - 4x - 6)$ (3)
4.5	$x = \left(\frac{1}{2}\right)^y$ $y = \log_{\frac{1}{2}} x$ OR $y = -\log_2 x$ OR $y = \log_2 \frac{1}{x}$	✓ answer (1) ✓ answer (1) ✓ answer (1)
4.6		✓ shape ✓ x-intercept ✓ point (4; -2) or any other point (3)
4.7.1	$0 < x \leq 4$ OR $x \in (0; 4]$	✓ $0 < x$ ✓ $x \leq 4$ (2) ✓ answer (2)
4.7.2	x-intercepts: $x = -3$ and $x = 1$ If $x < 0$ then $f(x) > 0$: $\therefore x < -3$ or if $x > 0$ then $f(x) < 0$: $\therefore 0 < x < 1$	✓✓ $x < -3$ ✓✓ $0 < x < 1$ (4)

OR $x \in (0; 1) \cup (-\infty; -3)$	$\checkmark\checkmark (0; 1)$ $\checkmark\checkmark (-\infty; -3)$ (4) [19]
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QUESTION 5

5.1	$0,10 \times R980\,000$ $= R98\,000$ $\therefore \text{Loan} = 980\,000 - 98\,000$ $= R882\,000$ OR $\text{Loan} = R980\,000 - 0,10 (R980\,000)$ $= R882\,000$ OR $\text{Loan} = 0,9 \times R980\,000$ $= R882\,000$	$\checkmark 0,10 \times R980\,000$ $\checkmark R882\,000$ (2) $\checkmark 0,10 \times R980\,000$ $\checkmark R882\,000$ (2) $\checkmark 0,9 \times R980\,000$ $\checkmark R882\,000$ (2)
5.2	$P_v = \frac{x[1 - (1+i)^{-n}]}{i}$ $882\,000 = \frac{10\,000 \left[1 - \left(1 + \frac{0,11}{12} \right)^{-n} \right]}{\frac{0,11}{12}}$ $\frac{1617}{2000} = 1 - \left(1 + \frac{0,11}{12} \right)^{-n}$ $\left(1 + \frac{0,11}{12} \right)^{-n} = \frac{383}{2000}$ $-n = \log_{\left(1 + \frac{0,11}{12} \right)} \frac{383}{2000}$ $-n = -181,14$ $n = 181,14$ $\therefore \text{It takes 182 months}$	$\checkmark i = \frac{0,11}{12}$ $\checkmark$ substitution into the correct formula $\checkmark \left(1 + \frac{0,11}{12} \right)^{-n} = \frac{383}{2000}$ $\checkmark$ introducing logs $-n = \log_{\left(1 + \frac{0,11}{12} \right)} \frac{383}{2000}$ or $-n = \log_{\left(\frac{1211}{1200} \right)} 0,1915$ or $-n = \frac{\log 0,1915}{\log 1,00916667}$ $\checkmark n = 181,14$ $\checkmark 182 \text{ months}$ (6)

OR

	$P_v = \frac{x[1 - (1 + i)^{-n}]}{i}$ $882\,000 = \frac{10\,000 \left[1 - \left(1 + \frac{0,11}{12} \right)^{-n} \right]}{\frac{0,11}{12}}$ $\frac{383}{2000} = \left(1 + \frac{0,11}{12} \right)^{-n}$ $\log \left(\frac{383}{2000} \right) = \log \left(1 + \frac{0,11}{12} \right)^{-n}$ $\log \left(\frac{383}{2000} \right) = -n \log \left(1 + \frac{0,11}{12} \right)$ $-n = -181,14$ $n = 181,14$ $\therefore$ It takes 182 months	✓ $i = \frac{0,11}{12}$ ✓ substitution into the correct formula ✓ $\frac{383}{2000} = \left(1 + \frac{0,11}{12} \right)^{-n}$ ✓ introducing logs $-n = \frac{\log \left(\frac{383}{2000} \right)}{\log \left(1 + \frac{0,11}{12} \right)}$ or $-n = \frac{\log 0,1915}{\log 1,00916667}$ ✓ $n = 181,14$ ✓ 182 months (6)
5.3	$n = 181,1379918 - 90$ $= 91,1379918$ $P_v = \frac{x[1 - (1 + i)^{-n}]}{i}$ $P_v = \frac{10\,000 \left[1 - \left(1 + \frac{0,11}{12} \right)^{-91,1379918} \right]}{\frac{0,11}{12}}$ $= R615\,991,70$ OR	✓ $n = 91,1379918$ ✓ substitution into the correct formula ✓ answer (3)

	$A = P(1 + i)^n$ $= 882\,000 \left(1 + \frac{0,11}{12}\right)^{90}$ $A = R2\,005\,069,01$ $F_v = \frac{i}{x[(1 + i)^n - 1]}$ $= \frac{10\,000 \left[\left(1 + \frac{0,11}{12}\right)^{90} - 1 \right]}{\frac{0,11}{12}}$ $F_v = R1\,389\,077,31$ Outstanding balance after 90 instalments: $= R2\,005\,069,01 - R1\,389\,077,31$ $= R615\,991,70$	✓ substitution into the correct formula (or 2 005 069,01) ✓ substitution into the correct formula (or 1 389 077,31) ✓ answer (R615 991,70) (3)
5.4	$A = P(1 + i)^n$ $= 615\,991,70 \left(1 + \frac{0,11}{12}\right)^5$ $= 644\,747,02$ $P_v = \frac{x[1 - (1 + i)^{-n}]}{i}$ $644\,747,02 = \frac{x \left[1 - \left(1 + \frac{0,11}{12}\right)^{-87} \right]}{\frac{0,11}{12}}$ $x = R10\,786,84$	✓ substitution into the correct formula ✓ answer ✓ substitution into the correct formula ✓ $n = 182 - 95 = 87$ ✓ answer (5) [16]

QUESTION 6

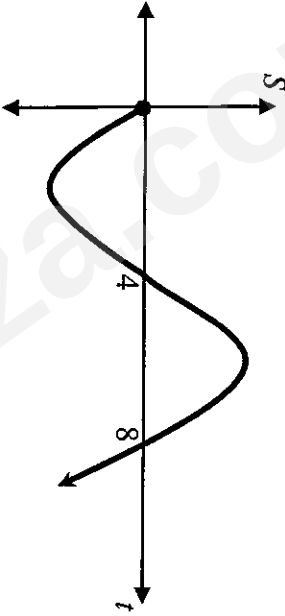
6.1	$f(x) = \frac{3}{x}$ $f(x+h) = \frac{3}{x+h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{\frac{3}{x+h} - \frac{3}{x}}{h}$ $= \lim_{h \rightarrow 0} \frac{3x - 3(x+h)}{x(x+h)} \times \frac{1}{h}$ $= \lim_{h \rightarrow 0} \frac{3x - 3x - 3h}{x(x+h)} \times \frac{1}{h}$ $= \lim_{h \rightarrow 0} \frac{-3h}{x(x+h)} \times \frac{1}{h}$ $= \lim_{h \rightarrow 0} \frac{-3}{x(x+h)}$ $= \frac{-3}{x^2}$	✓ subst $(x+h)$ in $f(x)$ ✓ substitution into formula ✓ substitution into formula ✓ simplification ✓ answer (5)
OR	$f(x) = \frac{3}{x}$ $f(x+h) = \frac{3}{x+h}$ $f(x+h) - f(x) = \frac{3}{x+h} - \frac{3}{x}$ $= \frac{3x - 3x - 3h}{x(x+h)}$ $= \frac{-3h}{x(x+h)}$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{\frac{-3h}{x(x+h)}}{h}$ $= \lim_{h \rightarrow 0} \frac{-3h}{x(x+h)} \times \frac{1}{h}$ $= \lim_{h \rightarrow 0} \frac{-3}{x(x+h)}$ $= \frac{-3}{x^2}$	✓ subst $(x+h)$ in $f(x)$ ✓ simplification ✓ answer (5)

6.2.1	$y = \pi^3 x - x^{\frac{1}{3}}$ $\frac{dy}{dx} = \pi^3 - \frac{1}{3} x^{-\frac{2}{3}}$	$\checkmark -x^{\frac{1}{3}}$ $\checkmark \pi^3$ $\checkmark -\frac{1}{3} x^{-\frac{2}{3}}$	(3)
6.2.2	$y = \frac{7}{4} x^4 - \frac{3}{4}$ $\frac{dy}{dx} = 7x^3$ OR $y = \frac{x(7x^4 - 3)}{4x}$ $= \frac{1}{4}(7x^4 - 3)$	$\checkmark y = \frac{7}{4} x^4 - \frac{3}{4}$ $\checkmark \frac{dy}{dx} = 7x^3$	(2)

7.1	$f(x) = x^3 + px^2 + qx - 12$ $36 = (-4)^3 + p(-4)^2 + q(-4) - 12$ $36 = -64 + 16p - 4q - 12$ $112 = 16p - 4q$ $28 = 4p - q \dots\dots(1)$ $f'(x) = 3x^2 + 2px + q$ $f'(-4) = 3(-4)^2 + 2p(-4) + q$ $0 = 48 - 8p + q$ $-48 = -8p + q \dots\dots(2)$ $28 = 4p - q \dots\dots(1)$ $(1) + (2):$ $-20 = -4p$ $5 = p$ $(1): 28 = 4(5) - q$ $q = -8$
✓ substitution of $(-4; 36)$ into $f(x)$ ✓ $28 = 4p - q$ ✓ $f'(x) = 3x^2 + 2px + q$ ✓ $f'(-4) = 0$ ✓ $48 = 8p - q$ OR $-48 = -8p + q$ ✓ simplification (6)	

7.2	$f(x) = x^3 + 5x^2 - 8x - 12$ $f(x) = (x + 1)(x^2 + 4x - 12)$ (<i>long division method</i>) $0 = (x + 1)(x^2 + 4x - 12)$ $0 = (x + 1)(x + 6)(x - 2)$ $x = -1$ or $x = -6$ or $x = 2$ Coordinates of other x-intercepts are: $(-6; 0)$ or $(2; 0)$ OR $(x + 1)(x^2 + bx - 12) = x^3 + 5x^2 - 8x - 12$ $bx - 12x = -8x$ $b - 12 = -8$ $\therefore b = 4$ $x^2 + 4x - 12 = 0$ $(x + 6)(x - 2) = 0$ $x = -6$ or $x = 2$ Coordinates of other x-intercepts are: $(-6; 0)$ or $(2; 0)$	✓ $(x + 1)(x^2 + 4x - 12)$ ✓ factors ✓ $(-6; 0)$ ✓ $(2; 0)$ ✓ $b = 4$ ✓ factors $(x + 6)(x - 2)$ ✓ $(-6; 0)$ ✓ $(2; 0)$	(4)
7.3	$f'(x) = 3x^2 + 10x - 8$ $f'(1) = 3(1)^2 + 10(1) - 8$ $= 5$ $y - y_1 = m(x - x_1)$ $y + 14 = 5(x - 1)$ $y = 5x - 19$ OR $f'(x) = 3x^2 + 10x - 8$ $f'(1) = 3(1)^2 + 10(1) - 8$ $= 5$ $y = mx + c$ $-14 = 5(1) + c$ $-19 = c$ $\therefore y = 5x - 19$	✓ $f'(x) = 3x^2 + 10x - 8$ ✓ $f'(1) = 5$ ✓ substitution ✓ answer ✓ $f'(x) = 3x^2 + 10x - 8$ ✓ $f'(1) = 5$ ✓ substitution ✓ answer	(4)
7.4	$0 < k \leq 7$	✓ $0 < k$ ✓ $k \leq 7$	(2) [16]

QUESTION 8

8.1 $S(t) = -t^3 + 12t^2 - 32t$ $0 = -t^3 + 12t^2 - 32t$ $0 = t^3 - 12t^2 + 32t$ $0 = t(t^2 - 12t + 32)$ $0 = t(t - 4)(t - 8)$ $t = 0 \text{ or } t = 4 \text{ or } t = 8$ $\therefore$ After 8 hours 	✓ $0 = t(t^2 - 12t + 32)$ ✓ factors ✓ $t = 8$
8.2 $S'(t) = -3t^2 + 24t - 32$ $0 = -3t^2 + 24t - 32$ $0 = 3t^2 - 24t + 32$ $t = \frac{24 \pm \sqrt{(-24)^2 - 4(3)(32)}}{2(3)}$ or $t = \frac{-24 \pm \sqrt{(24)^2 - 4(-3)(-32)}}{2(-3)}$ $t = 1,69 \text{ hours}$ or $t = 6,31 \text{ hours}$ $S(1,69) = -(1,69)^3 + 12(1,69)^2 - 32(1,69)$ $= -24,63 \text{ km}$ $S(6,31) = -(6,31)^3 + 12(6,31)^2 - 32(6,31)$ $= 24,63 \text{ km}$ $\therefore$ Distance is 24,63 km	✓ $S'(t) = -3t^2 + 24t - 32$ ✓ $S'(t) = 0$ ✓ substitution into the formula ✓ $t = 1,69$ or $t = 6,31$ ✓ 24,63 km (5)
8.3 $S''(t) = -6t + 24$ $0 = -6t + 24$ $6t = 24$ $\therefore t = 4$ $S'(4) = -3(4)^2 + 24(4) - 32$ $= 16 \text{ km/h}$	✓ $S''(t) = -6t + 24$ ✓ $S''(t) = 0$ ✓ $t = 4$ ✓ 16 km/h (4) [12]

QUESTION 9

9.1		First event: ✓ M 4/7 ; TM 3/7 Second event: ✓ M: ET 5/10; MT 3/10; CT 2/10 ✓ TM: ET 4/10; MT 5/10; CT 1/10 ✓ Outcomes (4)
9.2.1	$P(\text{TM and MT}) = \frac{3}{7} \cdot \frac{5}{10}$ $= \frac{3}{14}$	$\checkmark \frac{3}{7} \cdot \frac{5}{10}$ $\checkmark \frac{3}{14} \text{ or } 0,21$ (2)
9.2.2	$P(\text{ET}) = \frac{4}{7} \cdot \frac{5}{10} + \frac{3}{7} \cdot \frac{4}{10}$ $= \frac{16}{35} = 0,46$	$\checkmark \frac{4}{7} \cdot \frac{5}{10}$ $\checkmark \frac{3}{7} \cdot \frac{4}{10}$ $\checkmark \frac{16}{35} \text{ or } 0,46$ (3) [9]

QUESTION 10

10.1.1	$10^6 = 1\,000\,000$	✓ 10^6 or 1 000 000 (1)
10.1.2	$(8)(7)(6)(5)$ $= 1680$ OR ${}_8P_4$ $= 1680$	✓ $(8)(7)(6)(5)$ ✓ 1680 (2)
10.2	$10! - (9!)(2!)$ $= 3\,628\,800 - 725\,760$ $= 2\,903\,040$	✓ $10!$ ✓ $(9!)(2!)$ ✓ answer (3) [6]
TOTAL:		150

COGNITIVE GRID

Questions	Levels				Topics						
	L1	L2	L3	L4	Alg	Pat	Func	Fin	Diff	Prob	
1.1.1	2				2						
1.1.2		4			4						
1.1.3	3				3						
1.1.4			4		4						
1.2		6			6						
1.3				3	3						
2.1.1	1					1					
2.1.2		1				1					
2.1.3		4				4					
2.2.1	2					2					
2.2.2	3					3					
2.3				5		5					
2.4.1	1					1					
2.4.2			6			6					
3.1	2						2				
3.2		2					2				
3.3	3						3				
3.4	2						2				
3.5	2						2				
3.6				3			3				
3.7			3				3				
4.1	1						1				
4.2	1						1				
4.3		4					4				
4.4		3					3				
4.5	1						1				
4.6	3						3				
4.7.1				2			2				
4.7.2				4			4				
5.1	2							2			
5.2			6					6			
5.3			3					3			
5.4			5					5			
6.1			5						5		
6.2.1		3							3		
6.2.2		2							2		
7.1			6						6		
7.2		4							4		
7.3			4						4		
7.4				2					2		
8.1		3							3		
8.2		5							5		
8.3			4						4		

Question	Levels				Topics					
	L1	L2	L3	L4	Alg	Pat	Func	Fin	Diff	Prob
9.1		4								4
9.2.1		2								2
9.2.2		3								3
10.1.1	1									1
10.1.2		2								2
10.2				3						3
Policy:										
Marks	30	52,5	45	22,5	25	25	35	15	35	15
%	20	35	30	15						
Real:										
Marks	30	52	46	22	22	23	36	16	38	15
%	20	35	30	15						