



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

MATHEMATICS P1

FEBRUARY/MARCH 2012

MEMORANDUM

MARKS: 150

This memorandum consists of 20 pages.

QUESTION 1

<p>1.1.1</p>	$3x^2 - 5x = 2$ $3x^2 - 5x - 2 = 0$ $(3x + 1)(x - 2) = 0$ $x = -\frac{1}{3} \text{ or } x = 2$	<p>✓ standard form ✓ factors ✓ both answers</p> <p style="text-align: right;">(3)</p>
<p>1.1.2</p>	$x - \frac{2}{x} = 5$ $x^2 - 2 = 5x$ $x^2 - 5x - 2 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-(-5) \pm \sqrt{25 - 4(1)(-2)}}{2(1)}$ $x = \frac{5 \pm \sqrt{33}}{2}$ $x = 5,37 \text{ or } x = -0,37$	<p>✓ standard form</p> <p>✓ subs in correct formula</p> <p>✓✓ answers (one for each answer)</p> <p style="text-align: right;">(4)</p>
<p>1.1.3</p>	$(x + 1)(x - 3) > 12$ $x^2 - 2x - 3 > 12$ $x^2 - 2x - 15 > 0$ $(x - 5)(x + 3) > 0$ $\begin{array}{ccccccc} + & 0 & - & 0 & + & & \\ \hline & -3 & & 5 & & & \end{array} \text{ OR } \begin{array}{c} \text{---} \\ \diagdown \quad \diagup \\ \text{---} \end{array}$ $x < -3 \text{ or } x > 5$	<p>✓ multiplication</p> <p>✓ factors</p> <p>✓✓ answer</p> <p style="text-align: right;">(4)</p>

<p>1.2</p>	$r + p = 2$ $r = 2 - p$ $6r + 5rp - 5p = 8$ $6(2 - p) + 5(2 - p)p - 5p = 8$ $12 - 6p + 10p - 5p^2 - 5p = 8$ $5p^2 + p - 4 = 0$ $(5p - 4)(p + 1) = 0$ $p = \frac{4}{5} \quad \text{or} \quad p = -1$ $r = 2 - \left(\frac{4}{5}\right) \quad \text{or} \quad r = 2 - (-1)$ $r = \frac{6}{5} \quad \quad \quad r = 3$ <p>OR</p> $r + p = 2$ $p = 2 - r$ $6r + 5rp - 5p = 8$ $6r + 5r(2 - r) - 5(2 - r) = 8$ $6r + 10r - 5r^2 - 10 + 5r = 8$ $5r^2 - 21r + 18 = 0$ $(5r - 6)(r - 3) = 0$ $r = \frac{6}{5} \quad \text{or} \quad r = 3$ $p = 2 - \left(\frac{6}{5}\right) \quad \text{or} \quad p = 2 - (3)$ $p = \frac{4}{5} \quad \quad \quad p = -1$	<p>✓ $r = 2 - p$</p> <p>✓ substitution</p> <p>✓ simplification</p> <p>✓ factors</p> <p>✓ p-answers</p> <p>✓✓ r-answers (7)</p> <p>✓ $p = 2 - r$</p> <p>✓ substitution</p> <p>✓ standard form</p> <p>✓ factors</p> <p>✓ r-answers</p> <p>✓✓ p-answers (7)</p>
<p>1.3</p>	<p>Let the shortest side be x Sides of the prism: $x ; 2x ; 3x$ Volume = lbh $(x)(2x)(3x) = 3\ 072$ $6x^3 = 3\ 072$ $x^3 = 512$ $x = \sqrt[3]{512}$ $x = 8$</p>	<p>✓ let the shortest side be x</p> <p>✓ $x ; 2x ; 3x$</p> <p>✓ $(x)(2x)(3x) = 3\ 072$</p> <p>✓ answer (4)</p> <p style="text-align: right;">[22]</p>

QUESTION 2

2.1	$T_n = a + (n-1)d$ $173 = -7 + (n-1)(4)$ $173 = -7 + 4n - 4$ $4n = 184$ $n = 46$ <p>OR</p> $T_n = 4n - 11$ $173 = 4n - 11$ $4n = 184$ $n = 46$	$\checkmark d = 4$ $\checkmark T_n = -7 + 4(n-1)$ \checkmark answer (3) $\checkmark\checkmark T_n = 4n - 11$ \checkmark answer (3)
2.2	$S_n = \frac{n}{2}[a + l]$ $= \frac{46}{2}[-7 + 173]$ $= 23[166]$ $= 3\ 818$ <p>OR</p> $S_n = \frac{n}{2}[2a + (n-1)d]$ $= \frac{46}{2}[2(-7) + (45)(4)]$ $= 23[-14 + 180]$ $= 3\ 818$	\checkmark subs of $n = 46$ \checkmark subs of a and l into the correct formula \checkmark answer (3) \checkmark subs of $n = 46$ \checkmark subs of a and d into the correct formula \checkmark answer (3)
2.3	$\sum_{n=1}^{46} (4n - 11)$	$\checkmark n = 1$ \checkmark top value = 46 $\checkmark 4n - 11$ (3) [9]

QUESTION 3

3.1.1	$r = -\frac{1}{2}$ $T_4 = 1\left(-\frac{1}{2}\right)$ $= -\frac{1}{2}$	$\checkmark r = -\frac{1}{2}$ \checkmark answer (2)
3.1.2	$T_n = 4\left(-\frac{1}{2}\right)^{n-1}$ $\frac{1}{64} = 4\left(-\frac{1}{2}\right)^{n-1}$ $\frac{1}{256} = \left(-\frac{1}{2}\right)^{n-1}$ $\left(-\frac{1}{2}\right)^8 = \left(-\frac{1}{2}\right)^{n-1}$ $8 = n - 1$ $n = 9$ <p style="text-align: center;">OR</p> $T_n = -8\left(-\frac{1}{2}\right)^n$ $\frac{1}{64} = -8\left(-\frac{1}{2}\right)^n$ $\frac{1}{256} = \left(-\frac{1}{2}\right)^n$ $\left(-\frac{1}{2}\right)^8 = \left(-\frac{1}{2}\right)^{n-1}$ $8 = n - 1$ $n = 9$ <p style="text-align: center;">OR</p> $T_4 = -\frac{1}{2}$ $T_5 = \frac{1}{4}$ $T_6 = -\frac{1}{8}$ $T_7 = \frac{1}{16}$ $T_8 = -\frac{1}{32}$ $T_9 = \frac{1}{64}$ $n = 9$	$\checkmark 4\left(-\frac{1}{2}\right)^{n-1}$ \checkmark substitution $\checkmark \frac{1}{256} = \left(-\frac{1}{2}\right)^{n-1}$ \checkmark answer (4) $\checkmark T_5$ and T_6 $\checkmark T_7$ $\checkmark T_8$ \checkmark answer (4)
3.1.3	$S_\infty = \frac{a}{1-r}$ $= \frac{4}{1-\left(-\frac{1}{2}\right)}$ $= \frac{8}{3}$	\checkmark substitution into correct formula \checkmark answer (2)

<p>3.2</p>	<p>For a geometric sequence:</p> $\frac{x+1}{1} = \frac{x-3}{x+1}$ $x^2 + 2x + 1 = x - 3$ $x^2 + x + 4 = 0$ $x = \frac{-1 \pm \sqrt{1 - 4(1)(4)}}{2(1)}$ $x = \frac{-1 \pm \sqrt{-15}}{2}$ <p>Solution is non-real. There is no x-value that makes the sequence geometric.</p> <p>OR</p> <p>For a geometric sequence:</p> $\frac{x+1}{1} = \frac{x-3}{x+1}$ $x^2 + 2x + 1 = x - 3$ $x^2 + x + 4 = 0$ $b^2 - 4ac = 1 - 4(1)(4)$ $= -15$ <p>Solution is non-real There is no x-value that makes the sequence geometric.</p>	<p>✓ $\frac{T_2}{T_1} = \frac{T_3}{T_2}$</p> <p>✓ standard form</p> <p>✓ subs in quadratic formula</p> <p>✓ non-real/no x-values (4)</p> <p>✓ $\frac{T_2}{T_1} = \frac{T_3}{T_2}$</p> <p>✓ standard form</p> <p>✓ subs in discriminant</p> <p>✓ non-real/no x-values (4)</p> <p>[12]</p>
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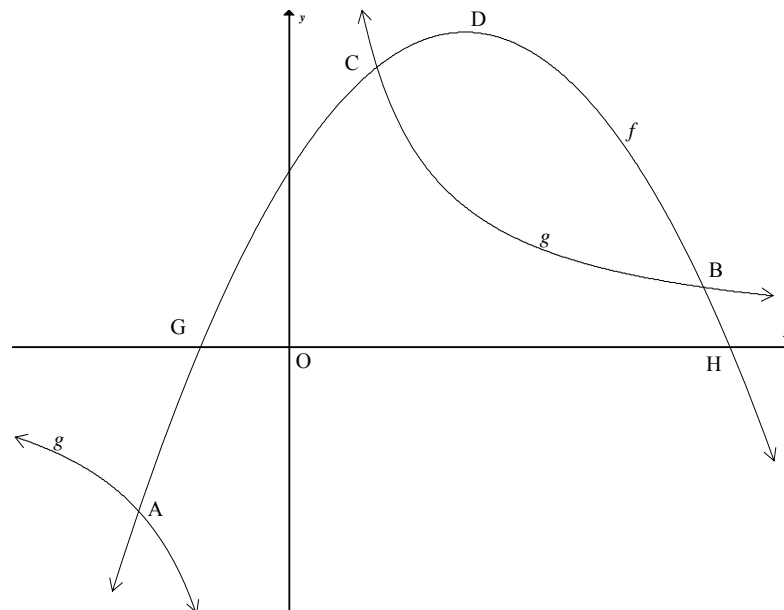
QUESTION 4

<p>4.1</p>	<div style="text-align: center;"> </div> <p> $r = 1$ $s = 2$ </p> <p>OR</p> <p>NOTE: Candidates may do 4.2 first.</p> <p> $d(n) = n^2 - 10n + 26$ $r = d(5)$ $= (5)^2 - 10(5) + 26$ $= 1$ $s = d(6)$ $= (6)^2 - 10(6) + 26$ $= 12$ </p> <p>OR</p> <p> $d(n) = (n - 5)^2 + 1$ $r = d(5)$ $= (5 - 5)^2 + 1$ $= 1$ $s = d(6)$ $= (6 - 5)^2 + 1$ $= 2$ </p>	<p>✓ complete pattern</p> <p>✓ $r = 1$</p> <p>✓ $s = 2$</p> <p style="text-align: right;">(3)</p> <p>✓</p> <p>$d(n) = n^2 - 10n + 26$</p> <p>✓ $r = 1$</p> <p>✓ $s = 2$</p> <p style="text-align: right;">(3)</p> <p>✓</p> <p>$d(n) = (n - 5)^2 + 1$</p> <p>✓ $r = 1$</p> <p>✓ $s = 2$</p> <p style="text-align: right;">(3)</p>
<p>4.2</p>	<p> $2a = 2$ $a = 1$ $3a + b = -7$ $\therefore 3(1) + b = -7$ $b = -10$ $\therefore a + b + c = 17$ $1 - 10 + c = 17$ $c = 26$ $\therefore d(n) = n^2 - 10n + 26$ </p> <p>OR</p>	<p>✓ $a = 1$</p> <p>✓ method</p> <p>✓ $b = -10$</p> <p>✓ $c = 26$</p> <p style="text-align: right;">(4)</p>

$a + b + c = 17$ $4a + 2b + c = 10$ $3a + b = -7$ $9a + 3b = -21$ $9a + 3b + c = 5$ $-21 + c = 5$ $c = 26$ $a + b = -9$ $4a + 2b = -16$ $2a + 2b = -18$ $2a = 2$ $a = 1$ $b = -10$ $d(n) = n^2 - 10n + 26$	OR	$a + b + c = 17$ $4a + 2b + c = 10$ $9a + 3b + c = 5$ $3a + b = -7$ $5a + b = -5$ $2a = 2$ $a = 1$ $3(1) + b = -7$ $b = -10$ $(1) - 10 + c = 17$ $c = 26$ $d(n) = n^2 - 10n + 26$	✓ method ✓ $a = 1$ ✓ $c = 26$ ✓ $b = -10$ (4)
OR $2a = 2$ $a = 1$ $c = 26$ $d(n) = n^2 + bn + 26$ $17 = (1)^2 + b + 26$ $b = -10$ $d(n) = n^2 - 10n + 26$			✓ method ✓ $a = 1$ ✓ $c = 26$ ✓ $b = -10$ (4)
OR $d(n) = \frac{n-1}{2} [2(\text{first difference}) + (n-2)(\text{second difference})] + d(1)$ $d(n) = \frac{n-1}{2} [2(-7) + (n-2)(2)] + 17$ $d(n) = \frac{n-1}{2} [-18 - 2n] + 17$ $d(n) = (n-1)(-9 - n) + 17$ $d(n) = n^2 - 10n + 26$			✓ method ✓ $a = 1$ ✓ $c = 26$ ✓ $b = -10$ (4)
OR			

	$d(n) = (n-1)d(2) - (n-2)d(1) + \text{second difference} \times \frac{(n-1)(n-2)}{2}$ $d(n) = (n-1)(10) - (n-2)(17) + \frac{2(n-1)(n-2)}{2}$ $d(n) = 10n - 10 - 17n + 34 + (n-1)(n-2)$ $d(n) = n^2 - 10n + 26$ <p>OR</p> $d(n) = (n-5)^2 + 1$ $= n^2 - 10n + 26$ $a = 1$ $b = -10$ $c = 26$	<p>✓ method ✓ $a = 1$ ✓ $c = 26$ ✓ $b = -10$ (4)</p> <p>✓ method ✓ $a = 1$ ✓ $c = 26$ ✓ $b = -10$ (4)</p>
4.3	$d(8) = (8)^2 - 10(8) + 26$ $= 10 \text{ m}$ <p style="text-align: center;">OR By symmetry</p> $d(8)$ $= d(5+3)$ $= d(5-3)$ $= d(2)$ $= 10$ <p>OR 17, 10, 5, 2, 1, 2, 5, 10 so $d(8) = 10$</p>	<p>✓ subs $t = 8$</p> <p>✓ answer (2)</p> <p>✓ method</p> <p>✓ answer (2)</p> <p>✓ method ✓ answer (2)</p>
4.4	<p>Since the distance from P is decreasing for $n < 5$ the athlete is moving towards P. Since the distance from P is increasing for $n > 5$, the athlete is moving away from P.</p> <p>OR</p> <p>It is sufficient to show that d is decreasing when $n < 5$ and increasing when $n > 5$</p> $d(n) = n^2 - 10n + 26$ $d'(n) = 2n - 10$ $d'(n) = 2(n - 5)$ <p>For $n < 5$, $2(n - 5) < 0$ $d'(n) < 0 \therefore$ decreasing</p> <p>For $n > 5$, $2(n - 5) > 0$ $d'(n) > 0 \therefore$ increasing</p>	<p>✓✓ decreasing Moving towards ✓✓ increasing Moving away</p> <p>✓ $d'(n) = 2n - 10$</p> <p>✓ $2(n - 5) < 0$ ✓ decreasing</p> <p>✓ increasing (4) [13]</p>

QUESTION 5



5.1	$x = 0$ $y = 0$	✓ answer ✓ answer (2)
5.2	$f(x) = -2x^2 + 8x + 10$ $x^2 - 4x - 5 = 0$ $(x - 5)(x + 1) = 0$ $x = 5$ or $x = -1$ $H(5 ; 0)$	✓ equate to 0 ✓ factors ✓ x-values ✓ answer (4)
5.3	$f(x) = -2x^2 + 8x + 10$ $f(x) = -2(x - 2)^2 + 18$ Range of f is $y \leq 18$ OR $y \in (-\infty ; 18]$ OR $f(x) = -2x^2 + 8x + 10$ $x = -\frac{8}{2(-2)}$ $x = 2$ $y = -2(2)^2 + 8(2) + 10$ $y = 18$ Range of f is $y \leq 18$ OR $y \in (-\infty ; 18]$ OR	✓ method ✓ $(x - 2)^2$ ✓ 18 ✓ answer (4) ✓ method ✓ $x = 2$ ✓ $y = 18$ ✓ answer (4) ✓ method

	$x = \frac{5-1}{2}$ $x = 2$ $y = -2(2)^2 + 8(2) + 10$ $y = 18$ Range of f is $y \leq 18$ OR $y \in (-\infty ; 18]$	✓ $x = 2$ ✓ $y = 18$ ✓ answer (4)
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	OR $f(x) = -2x^2 + 8x + 10$ $f'(x) = -4x + 8$ $0 = -4x + 8$ $x = 2$ $y = -2(2)^2 + 8(2) + 10$ $y = 18$ Range of f is $y \leq 18$ OR $y \in (-\infty ; 18]$	✓ method ✓ $x = 2$ ✓ $y = 18$ ✓ answer (4)
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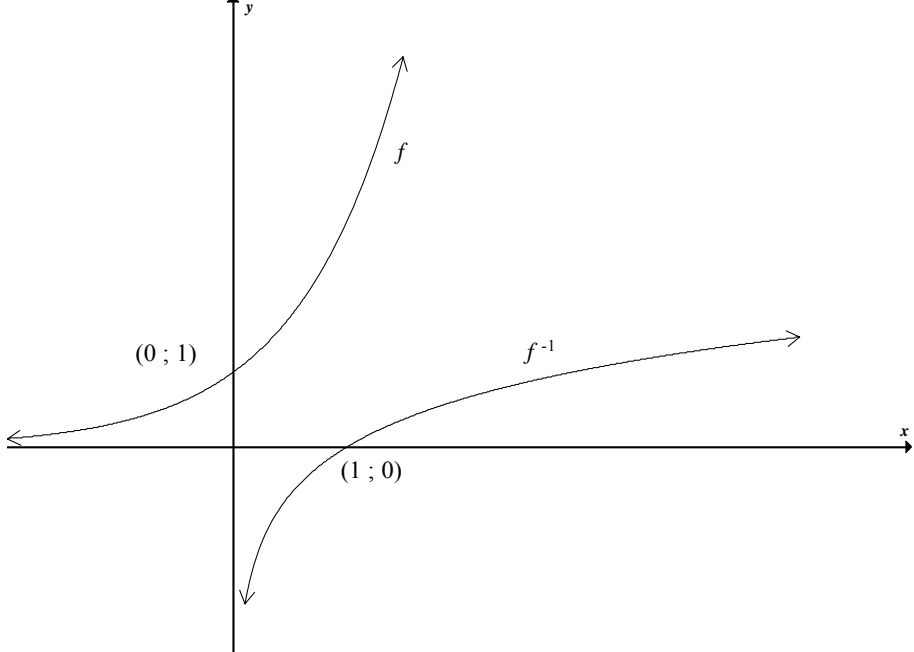
5.4	$f(1) = -2(1)^2 + 8(1) + 10$ $f(1) = 16$ $g(1) = \frac{16}{1}$ $g(1) = 16$ C(1 ; 16) lies on both the graphs of f and g OR $-2x^2 + 8x + 10 = \frac{16}{x}$ $-2x^3 + 8x^2 + 10x - 16 = 0$ $x^3 - 4x^2 - 5x + 8 = 0$ $(x-1)(x^2 - 3x - 8) = 0$ $x = 1 \text{ or } x^2 - 3x - 8 = 0$ C(1 ; 16)	✓ substitution $f(1)$ ✓ substitution $g(1)$ (2) ✓ equating ✓ answer (2)
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5.5	$p(x) = f(3x)$ $3x = 2$ $x = \frac{2}{3}$ TP $(\frac{2}{3} ; 18)$ OR $p(x) = -2(3x)^2 + 8(3x) + 10$ $= -18x^2 + 24x + 10$	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> NOTE: Answer Only: Full Marks </div>	✓ $3x = 2$ ✓ $x = \frac{2}{3}$ ✓ $y = 18$ (3) ✓ $x = -\frac{24}{2(-18)}$ ✓ $x = \frac{2}{3}$
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$x = -\frac{24}{2(-18)}$ $x = \frac{2}{3}$ TP $(\frac{2}{3}; 18)$ OR	$\checkmark y = 18$ (3)
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$p(x) = -2(3x)^2 + 8(3x) + 10$ $= -18x^2 + 24x + 10$ $p'(x) = -36x + 24$ $0 = -36x + 24$ $x = \frac{2}{3}$ TP $(\frac{2}{3}; 18)$ OR $p(x) = -2(3x)^2 + 8(3x) + 10$ $= -18x^2 + 24x + 10$ $= -18\left(x - \frac{2}{3}\right)^2 + 18$ TP $(\frac{2}{3}; 18)$	$\checkmark 0 = -36x + 24$ $\checkmark x = \frac{2}{3}$ $\checkmark y = 18$ (3) \checkmark $p(x) = -18\left(x - \frac{2}{3}\right)^2 + 18$ $\checkmark x = \frac{2}{3}$ $\checkmark y = 18$ (3) [15]
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QUESTION 6

6.1	$f(x) = 3^x$ $f^{-1}(x) = \log_3 x$	✓ answer (1)
6.2		$f^{-1}(x) = \log_3 x$ (Log Graph) ✓ shape ✓ x-intercept $f(x) = 3^x$ (Exponential Graph) ✓ shape ✓ y-intercept (4)
6.3	$x > 0$ OR $x \in (0; \infty)$	✓✓ answer (2)
6.4	$0 < x \leq 1$	✓ critical values ✓ notation (2)
6.5	$y > -4$ OR $y \in (-4; \infty)$	✓✓ answer (2)
6.6	$g(x) = -3^{x-2}$ OR $g(x) = -f(x-2)$ OR $g(x) = -\frac{1}{9}(3^x)$ OR $g(x) = -\frac{1}{9}f(x)$	✓ – (sign) ✓ $x - 2$ (2) ✓ – (sign) ✓ $\frac{1}{9}$ (2) [13]

QUESTION 7

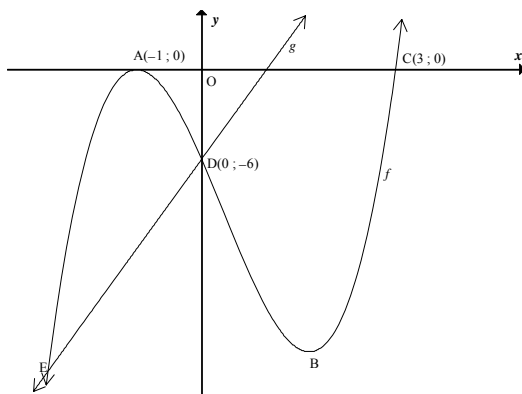
<p>7.1</p>	$\frac{88}{100} \times 850\,000$ $= R748\,000$ <p>OR</p> $\frac{12}{100} \times 850\,000$ $= R102\,000$ <p>Loan amount = R850 000 – R102 000 = R748 000</p>	<p>✓ $\frac{88}{100} \times 850\,000$ ✓ answer (2)</p> <p>✓ $\frac{12}{100} \times 850\,000$ ✓ answer (2)</p>
<p>7.2</p>	$1 + i_e = \left(1 + \frac{0,09}{12}\right)^{12}$ $i_e = 0,09380689$ $r = 9,38\% \text{ p.a.}$ $\neq 9,6\%$ <p>Not correct</p> <p>OR</p> $1 + 0,096 = \left(1 + \frac{i}{12}\right)^{12}$ $\sqrt[12]{1,096} = 1 + \frac{i}{12}$ $1,007668183 = 1 + \frac{i}{12}$ $i = 0,092018201$ $r = 9,2\% \text{ p.a.}$ $\neq 9\%$ <p>Not correct</p>	<p>✓ $\frac{0,09}{12}$ ✓ substitution ✓ answer ✓ decision (4)</p> <p>✓ $\frac{i}{12}$ ✓ substitution</p> <p>✓ answer ✓ decision (4)</p>
<p>7.3</p>	$P_v = \frac{x[1 - (1 + i)^{-n}]}{i}$ $748\,000 = \frac{x \left[1 - \left(1 + \frac{0,09}{12} \right)^{-240} \right]}{\frac{0,09}{12}}$ $x = R6\,729,95$	<p>✓ subs into correct formula ✓ $i = \frac{0,09}{12}$ ✓ $n = -240$ ✓ answer (4)</p>

7.4	$P_v = \frac{x[1-(1+i)^{-n}]}{i}$ $748\,000 = \frac{7\,000 \left[1 - \left(1 + \frac{0,09}{12} \right)^{-n} \right]}{\frac{0,09}{12}}$ $\frac{561}{700} = 1 - \left(1 + \frac{0,09}{12} \right)^{-n}$ $\left(1 + \frac{0,09}{12} \right)^{-n} = \frac{139}{700}$ $-n \log \left(1 + \frac{0,09}{12} \right) = \log \frac{139}{700}$ $n = 216,35 \text{ months}$ $= 18,03 \text{ years}$ <p>OR</p> $P_v = \frac{x[1-(1+i)^{-12n}]}{i}$ $748\,000 = \frac{7\,000 \left[1 - \left(1 + \frac{0,09}{12} \right)^{-12n} \right]}{\frac{0,09}{12}}$ $\frac{561}{700} = 1 - \left(1 + \frac{0,09}{12} \right)^{-12n}$ $\left(1 + \frac{0,09}{12} \right)^{-12n} = \frac{139}{700}$ $-12n \log \left(1 + \frac{0,09}{12} \right) = \log \frac{139}{700}$ $n = 18,03 \text{ years}$	<p>✓ subs into correct formula</p> <p>✓ simplification</p> <p>✓ use of logs</p> <p>✓ answer (4)</p> <p>✓ subs into correct formula</p> <p>✓ simplification</p> <p>✓ use of logs</p> <p>✓ answer (4)</p> <p style="text-align: right;">[14]</p>
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QUESTION 8

<p>8.1</p>	$f(x) = 9 - x^2$ $f(x+h) = 9 - (x+h)^2$ $= 9 - x^2 - 2xh - h^2$ $f(x+h) - f(x) = -2xh - h^2$ $f'(x) = \lim_{h \rightarrow 0} \frac{-2xh - h^2}{h}$ $= \lim_{h \rightarrow 0} \frac{h(-2x - h)}{h}$ $= \lim_{h \rightarrow 0} (-2x - h)$ $= -2x$ <p>OR</p> $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{9 - (x+h)^2 - (9 - x^2)}{h}$ $= \lim_{h \rightarrow 0} \frac{9 - (x^2 + 2xh + h^2) - 9 + x^2}{h}$ $= \lim_{h \rightarrow 0} \frac{-2xh - h^2}{h}$ $= \lim_{h \rightarrow 0} \frac{h(-2x - h)}{h}$ $= \lim_{h \rightarrow 0} (-2x - h)$ $= -2x$	<p>✓ substitution</p> <p>✓ simplification</p> <p>✓ formula</p> <p>✓ common factor</p> <p>✓ answer</p> <p>(5)</p> <p>✓ formula</p> <p>✓ substitution</p> <p>✓ simplification</p> <p>✓ common factor</p> <p>✓ answer</p> <p>(5)</p>
<p>8.2.1</p>	$D_x[1 + 6\sqrt{x}]$ $= D_x\left[1 + 6x^{\frac{1}{2}}\right]$ $= 3x^{-\frac{1}{2}}$	<p>✓ $6x^{\frac{1}{2}}$</p> <p>✓ answer</p> <p>(2)</p>
<p>8.2.2</p>	$y = \frac{8 - 3x^6}{8x^5}$ $= \frac{1}{x^5} - \frac{3}{8}x$ $= x^{-5} - \frac{3}{8}x$ $\frac{dy}{dx} = -5x^{-6} - \frac{3}{8}$	<p>✓ x^{-5}</p> <p>✓ $\frac{3}{8}x$</p> <p>✓ $-5x^{-6}$</p> <p>✓ $-\frac{3}{8}$</p> <p>(4)</p> <p>[11]</p>

QUESTION 9



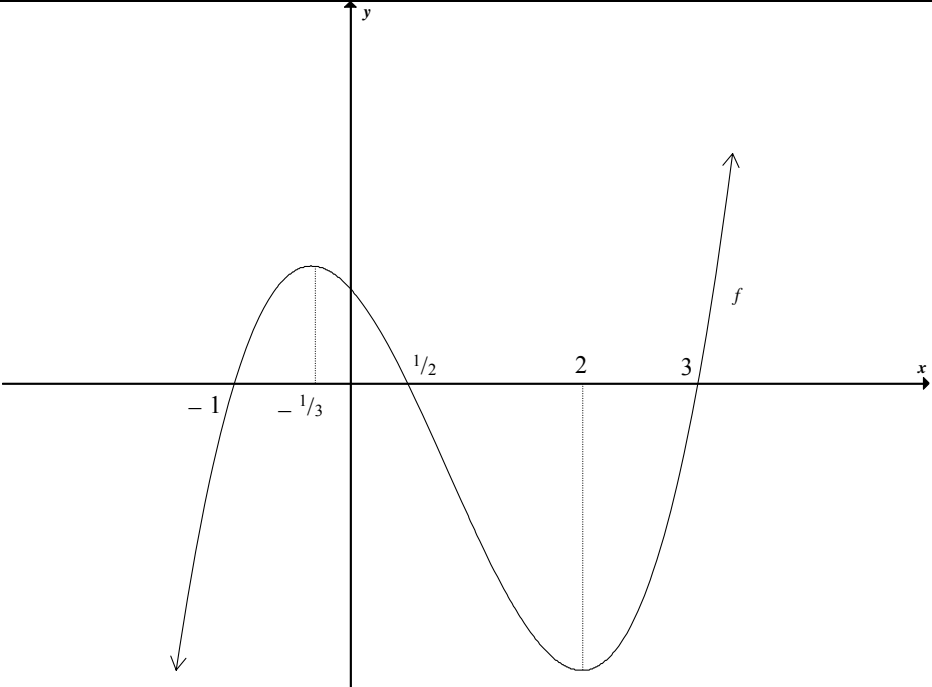
<p>9.1</p>	$f(x) = a(x+1)^2(x-3)$ $-6 = a(0+1)^2(0-3)$ $-6 = -3a$ $a = 2$ $f(x) = 2(x^2 + 2x + 1)(x-3)$ $= 2x^3 - 2x^2 - 10x - 6$	<ul style="list-style-type: none"> ✓✓ substitution of x-values ✓ subs (0 ; -6) ✓ a = 2 ✓ simplification <p style="text-align: right;">(5)</p>
<p>9.2</p>	$f'(x) = 6x^2 - 4x - 10$ $6x^2 - 4x - 10 = 0$ $3x^2 - 2x - 5 = 0$ $(3x-5)(x+1) = 0$ $x = \frac{5}{3} \text{ or } x = -1$ $B\left(\frac{5}{3}; -\frac{512}{27}\right) \text{ OR } B(1,67; -18,96)$	<ul style="list-style-type: none"> ✓ $f'(x) = 6x^2 - 4x - 6$ ✓ $f'(x) = 0$ ✓ factors ✓ x-value ✓ y-value <p style="text-align: right;">(5)</p>
<p>9.3</p>	$h(x) = 2x^3 - 2x^2 - 10x - 6 - (6x - 6)$ $= 2x^3 - 2x^2 - 16x$ $h'(x) = 6x^2 - 4x - 16$ $0 = 3x^2 - 2x - 8$ $0 = (3x+4)(x-2)$ $x = -\frac{4}{3} \text{ or } x = 2$ $\therefore x = -\frac{4}{3}$	<ul style="list-style-type: none"> ✓ $h(x) = 2x^3 - 2x^2 - 16x$ ✓ $h'(x) = 6x^2 - 4x - 16$ ✓ $h'(x) = 0$ ✓ factors ✓ correct x-value <p style="text-align: right;">(5)</p>

[15]

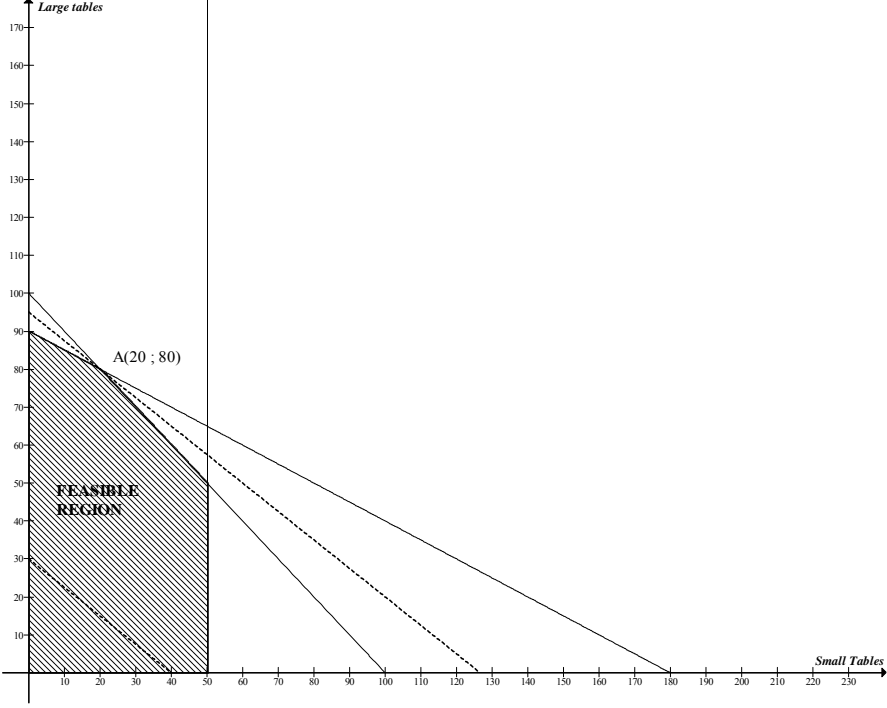
QUESTION 10

10.1	$y = 5(1) - 8$ $= -3$ Point of contact is $(1 ; -3)$	✓ subs 1 (1)
10.2	$-3 = 2(1)^3 + p(1)^2 + q(1) - 7$ $2 = p + q$ $g'(x) = 6x^2 + 2px + q$ $g'(1) = 5$ $5 = 6(1)^2 + 2p(1) + q$ $-1 = 2p + q$ $p = -3$ $q = 5$	✓ subs $(1 ; -3)$ ✓ $g'(x) = 6x^2 + 2px + q$ ✓ subs $x = 1$ and $y = 5$ ✓ simplification ✓ p -value ✓ q -value (6) [7]

QUESTION 11

		✓ x -intercepts ✓ turning point ✓✓ shape [4]
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QUESTION 12

<p>12.1</p>	<p>$x, y \in N_0$ $x + y \leq 100$ $x \leq 50$ $x + 2y \leq 180$</p> <p style="text-align: center;">OR</p> <p>$y \leq -x + 100$ $x \leq 50$ $y \leq -\frac{1}{2}x + 90$</p>	<p>✓✓ $x + y \leq 100$ ✓✓ $x + 2y \leq 180$ ✓ $x \leq 50$</p> <p style="text-align: right;">(5)</p>
<p>12.2</p>		<p>✓✓✓ each constraint ✓ feasible region</p> <p style="text-align: right;">(4)</p>
<p>12.3</p>	<p>90 tables</p>	<p>✓ answer</p> <p style="text-align: right;">(1)</p>
<p>12.4</p>	<p>$P = 300x + 400y$</p>	<p>✓ answer</p> <p style="text-align: right;">(1)</p>
<p>12.5</p>	<p>Maximum at A (20 ; 80) 20 small tables and 80 large tables.</p>	<p>✓✓ answer</p> <p style="text-align: right;">(2)</p>
<p>12.6</p>	<p>$P = qx + 400y$</p> <p>$m = -\frac{q}{400}$</p> <p>$-1 \leq -\frac{q}{400} \leq -\frac{1}{2}$</p> <p>$200 \leq q \leq 400$</p>	<p>✓ $m = -\frac{q}{400}$ ✓ $200 \leq q \leq 400$</p> <p style="text-align: right;">(2) [15]</p>

TOTAL: 150

QUESTION 12.2

