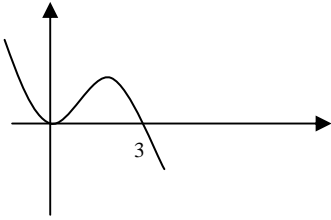
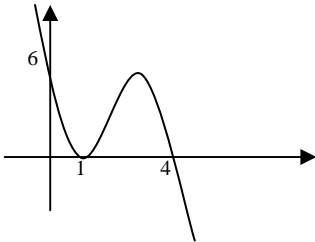
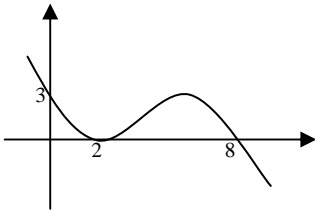


Question number	Scheme	Marks
1.	$x(x^2 - 4x + 3)$ $= x(x - 3)(x - 1)$	Factor of x . (Allow $(x - 0)$) Factorise 3 term quadratic M1 M1 A1 (3) Total 3 marks
2.	(a) $u_2 = (-2)^2 = 4$ $u_3 = 1, u_4 = 4$ (b) $u_{20} = 4$	For u_3 , ft $(u_2 - 3)^2$ B1 B1ft, B1 (3) B1ft (1) Total 4 marks
3.	(a) $y = 5 - (2 \times 3) = -1$ (b) Gradient of L is $\frac{1}{2}$ $y - (-1) = \frac{1}{2}(x - 3)$ $x - 2y - 5 = 0$	(or equivalent verification) (*) B1 (1) B1 (ft from a <u>changed</u> gradient) M1 A1ft A1 (or equiv. with integer coefficients) (4) Total 5 marks

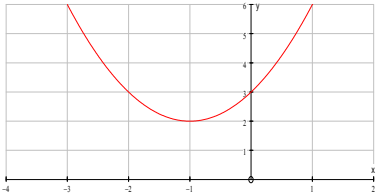
Question number	Scheme	Marks
4.	<p>(a) $\frac{dy}{dx} = 4x + 18x^{-4}$ M1: $x^2 \rightarrow x$ or $x^{-3} \rightarrow x^{-4}$</p> <p>(b) $\frac{2x^3}{3} - \frac{6x^{-2}}{-2} + C$ M1: $x^2 \rightarrow x^3$ or $x^{-3} \rightarrow x^{-2}$ or $+C$</p> <p>$\left(= \frac{2x^3}{3} + 3x^{-2} + C \right)$ First A1: $\frac{2x^3}{3} + C$</p> <p>Second A1: $-\frac{6x^{-2}}{-2}$</p>	<p>M1 A1 (2)</p> <p>M1 A1 A1 (3)</p> <p>Total 5 marks</p>

5.	<p>(a) $3\sqrt{5}$ (or $a = 3$)</p> <p>(b) $\frac{2(3+\sqrt{5})}{(3-\sqrt{5})} \times \frac{(3+\sqrt{5})}{(3+\sqrt{5})}$</p> <p>$(3-\sqrt{5})(3+\sqrt{5}) = 9-5$ (= 4) (Used as or intended as denominator)</p> <p>$(3+\sqrt{5})(p \pm q\sqrt{5}) = \dots$ 4 terms ($p \neq 0, q \neq 0$) (Independent)</p> <p>or $(6+2\sqrt{5})(p \pm q\sqrt{5}) = \dots$ 4 terms ($p \neq 0, q \neq 0$)</p> <p>[Correct version: $(3+\sqrt{5})(3+\sqrt{5}) = 9+3\sqrt{5}+3\sqrt{5}+5$, or double this.]</p> <p>$\frac{2(14+6\sqrt{5})}{4} = 7+3\sqrt{5}$ 1st A1: $b = 7$, 2nd A1: $c = 3$</p>	<p>B1 (1)</p> <p>M1</p> <p>B1</p> <p>M1</p> <p>A1 A1 (5)</p> <p>Total 6 marks</p>
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Question number	Scheme	Marks
6.	<p>(a) </p> <p>(See below) Clearly through origin (or (0, 0) seen) 3 labelled (or (3, 0) seen)</p> <p>(b) </p> <p>Stretch parallel to y-axis 1 and 4 labelled (or (1, 0) and (4, 0) seen) 6 labelled (or (0, 6) seen)</p> <p>(c) </p> <p>Stretch parallel to x-axis 2 and 8 labelled (or (2, 0) and (8, 0) seen) 3 labelled (or (0, 3) seen)</p>	<p>M1 A1 A1 (3)</p> <p>M1 A1 A1 (3)</p> <p>M1 A1 A1 (3)</p> <p>Total 9 marks</p>

7.	<p>(a) $500 + (500 + 200) = 1200$ or $S_2 = \frac{1}{2}2\{1000 + 200\} = 1200$ (*)</p> <p>(b) Using $a = 500, d = 200$ with $n = 7, 8$ or 9 $a + (n - 1)d$ or “listing” $500 + (7 \times 200) = (\pounds)1900$</p> <p>(c) Using $\frac{1}{2}n\{2a + (n - 1)d\}$ or $\frac{1}{2}n\{a + l\}$, or listing and “summing” terms $S_8 = \frac{1}{2}8\{2 \times 500 + 7 \times 200\}$ or $S_8 = \frac{1}{2}8\{500 + 1900\}$, or all terms in list correct $= (\pounds) 9600$</p> <p>(d) $\frac{1}{2}n\{2 \times 500 + (n - 1) \times 200\} = 32000$ M1: General S_n, equated to 32000 $n^2 + 4n - 320 = 0$ (or equiv.) M1: Simplify to 3 term quadratic $(n + 20)(n - 16) = 0$ $n = \dots$ M1: Attempt to solve 3 t.q. $n = 16,$ Age is 26 A1cso,A1cso</p>	<p>B1 (1)</p> <p>M1 A1 (2)</p> <p>M1 A1 A1 (3)</p> <p>M1 A1 M1 A1 M1 A1cso,A1cso (7)</p> <p>Total 13 marks</p>
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Question number	Scheme	Marks
8.	$\frac{5x^2 + 2}{x^{\frac{1}{2}}} = 5x^{\frac{3}{2}} + 2x^{-\frac{1}{2}}$ <p>M1: One term correct.</p> <p>A1: Both terms correct, and no extra terms.</p> $f(x) = 3x + \frac{5x^{\frac{5}{2}}}{\left(\frac{5}{2}\right)} + \frac{2x^{\frac{1}{2}}}{\left(\frac{1}{2}\right)} (+C) \quad (+ C \text{ not required here})$ <p>6 = 3 + 2 + 4 + C Use of $x = 1$ and $y = 6$ to form eqn. in C</p> <p>$C = -3$</p> $3x + 2x^{\frac{5}{2}} + 4x^{\frac{1}{2}} - 3 \quad (\text{simplified version required})$ <p>[or: $3x + 2\sqrt{x^5} + 4\sqrt{x} - 3$ or equiv.]</p>	<p>M1 A1</p> <p>M1 A1ft</p> <p>M1</p> <p>A1cso</p> <p>A1 (ft C)</p> <p>(7)</p> <p>Total 7 marks</p>
9.	<p>(a) -2 (P), 2 (Q) (± 2 scores B1 B1)</p> <p>(b) $y = x^3 - x^2 - 4x + 4$ (May be seen earlier) Multiply out, giving 4 terms</p> $\frac{dy}{dx} = 3x^2 - 2x - 4 \quad (*)$ <p>(c) At $x = -1$: $\frac{dy}{dx} = 3(-1)^2 - 2(-1) - 4 = 1$</p> <p>Eqn. of tangent: $y - 6 = 1(x - (-1)), \quad y = x + 7 \quad (*)$</p> <p>(d) $3x^2 - 2x - 4 = 1$ (Equating to “gradient of tangent”)</p> $3x^2 - 2x - 5 = 0 \quad (3x - 5)(x + 1) = 0 \quad x = \dots$ <p>$x = \frac{5}{3}$ or equiv.</p> $y = \left(\frac{5}{3} - 1\right)\left(\frac{25}{9} - 4\right), \quad = \frac{2}{3} \times \left(-\frac{11}{9}\right) = -\frac{22}{27} \text{ or equiv.}$	<p>B1, B1</p> <p>(2)</p> <p>M1</p> <p>M1 A1cso</p> <p>(3)</p> <p>M1 A1cso</p> <p>(2)</p> <p>M1</p> <p>M1</p> <p>A1</p> <p>M1, A1</p> <p>(5)</p> <p>Total 12 marks</p>

Question number	Scheme	Marks
10.	(a) $x^2 + 2x + 3 = (x + 1)^2, + 2$ $(a = 1, b = 2)$	B1, B1 (2)
	(b) 	“U”-shaped parabola Vertex in correct quadrant (ft from $(-a, b)$ $(0, 3)$ (or 3 on y-axis)
	(c) $b^2 - 4ac = 4 - 12 = -8$ Negative, so curve does not cross x -axis	B1 B1 (2)
	(d) $b^2 - 4ac = k^2 - 12$ (May be within the quadratic formula) $k^2 - 12 < 0$ (Correct inequality expression in any form)	M1 A1
	$-\sqrt{12} < k < \sqrt{12}$ (or $-2\sqrt{3} < k < 2\sqrt{3}$)	M1 A1 (4) Total 11 marks