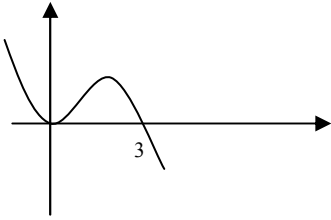
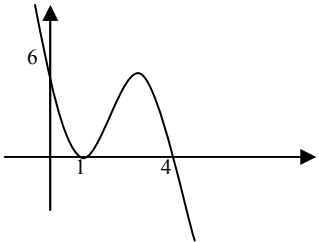
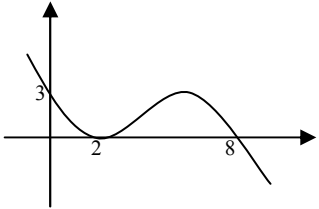


Question number	Scheme	Marks
1.	$x(x^2 - 4x + 3)$ $= x(x - 3)(x - 1)$	Factor of $x$ . (Allow $(x - 0)$ ) Factorise 3 term quadratic M1 M1 A1 (3) <b>Total 3 marks</b>
2.	(a) $u_2 = (-2)^2 = 4$ $u_3 = 1, u_4 = 4$ (b) $u_{20} = 4$	For $u_3$ , ft $(u_2 - 3)^2$ B1 B1ft, B1 (3) B1ft (1) <b>Total 4 marks</b>
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) <b>Total 5 marks</b>

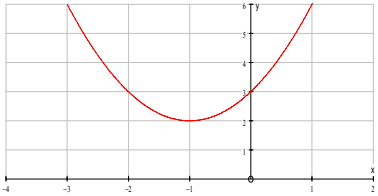
Question number	Scheme	Marks
4.	<p>(a) <math>\frac{dy}{dx} = 4x + 18x^{-4}</math> M1: <math>x^2 \rightarrow x</math> or <math>x^{-3} \rightarrow x^{-4}</math></p> <p>(b) <math>\frac{2x^3}{3} - \frac{6x^{-2}}{-2} + C</math> M1: <math>x^2 \rightarrow x^3</math> or <math>x^{-3} \rightarrow x^{-2}</math>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

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

7.	<p>(a) <math>500 + (500 + 200) = 1200</math> or <math>S_2 = \frac{1}{2}2\{1000 + 200\} = 1200</math> (*)</p> <p>(b) Using <math>a = 500, d = 200</math> with <math>n = 7, 8</math> or <math>9</math> <math>a + (n - 1)d</math> or “listing” <math>500 + (7 \times 200) = (\pounds)1900</math></p> <p>(c) Using <math>\frac{1}{2}n\{2a + (n - 1)d\}</math> or <math>\frac{1}{2}n\{a + l\}</math>, or listing and “summing” terms <math>S_8 = \frac{1}{2}8\{2 \times 500 + 7 \times 200\}</math> or <math>S_8 = \frac{1}{2}8\{500 + 1900\}</math>, or all terms in list correct <math>= (\pounds) 9600</math></p> <p>(d) <math>\frac{1}{2}n\{2 \times 500 + (n - 1) \times 200\} = 32000</math> M1: General <math>S_n</math>, equated to 32000 <math>n^2 + 4n - 320 = 0</math> (or equiv.) M1: Simplify to 3 term quadratic <math>(n + 20)(n - 16) = 0</math> <math>n = \dots</math> M1: Attempt to solve 3 t.q. <math>n = 16,</math> 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><b>Total 13 marks</b></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><math>6 = 3 + 2 + 4 + C</math> Use of <math>x = 1</math> and <math>y = 6</math> to form eqn. in <math>C</math></p> <p><math>C = -3</math></p> $3x + 2x^{\frac{5}{2}} + 4x^{\frac{1}{2}} - 3 \quad (\text{simplified version required})$ <p>[or: <math>3x + 2\sqrt{x^5} + 4\sqrt{x} - 3</math> 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><b>Total 7 marks</b></p>
9.	<p>(a) <math>-2</math> (P), <math>2</math> (Q) <math>(\pm 2 \text{ scores B1 B1})</math></p> <p>(b) <math>y = x^3 - x^2 - 4x + 4</math> (May be seen earlier) <math>\text{Multiply out, giving 4 terms}</math></p> $\frac{dy}{dx} = 3x^2 - 2x - 4 \quad (*)$ <p>(c) At <math>x = -1</math>: <math>\frac{dy}{dx} = 3(-1)^2 - 2(-1) - 4 = 1</math></p> <p>Eqn. of tangent: <math>y - 6 = 1(x - (-1)), \quad y = x + 7 \quad (*)</math></p> <p>(d) <math>3x^2 - 2x - 4 = 1</math> (Equating to “gradient of tangent”)</p> $3x^2 - 2x - 5 = 0 \quad (3x - 5)(x + 1) = 0 \quad x = \dots$ <p><math>x = \frac{5}{3}</math> 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><b>Total 12 marks</b></p>

Question number	Scheme	Marks	
10.	(a) $x^2 + 2x + 3 = (x + 1)^2, + 2$ <span style="margin-left: 100px;"><math>(a = 1, b = 2)</math></span>	B1, B1 (2)	
	(b) 	“U”-shaped parabola Vertex in correct quadrant (ft from $(-a, b)$ $(0, 3)$ (or 3 on $y$ -axis)	M1 A1ft B1 (3)
	(c) $b^2 - 4ac = 4 - 12 = -8$ Negative, so curve does not cross $x$ -axis	B1 B1 (2)	
	(d) $b^2 - 4ac = k^2 - 12$ <span style="margin-left: 100px;">(May be within the quadratic formula)</span> $k^2 - 12 < 0$ <span style="margin-left: 100px;">(Correct inequality expression in any form)</span>	M1 A1	
	$-\sqrt{12} < k < \sqrt{12}$ <span style="margin-left: 100px;">(or <math>-2\sqrt{3} &lt; k &lt; 2\sqrt{3}</math>)</span>	M1 A1 (4)  <b>Total 11 marks</b>	