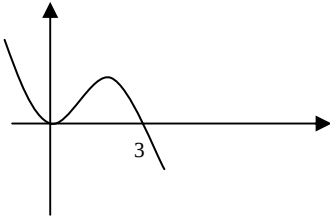
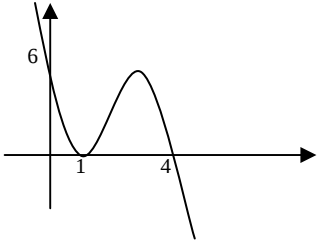
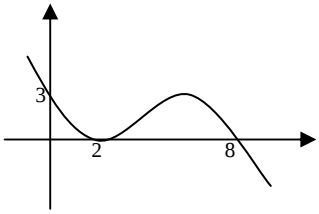
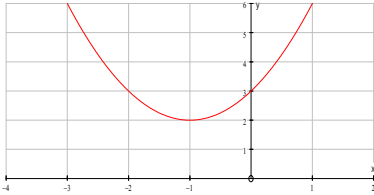


Question number	Scheme	Marks
1.	$x(x^2 - 4x + 3)$ $= x(x - 3)(x - 1)$	Factor of x . (Allow $(x - 0)$) Factorise 3 term quadratic M1 M1 A1 (3) Total 3 marks
2.	(a) $u_2 = (-2)^2 = 4$ $u_3 = 1, u_4 = 4$ For u_3 , ft $(u_2 - 3)^2$ (b) $u_{20} = 4$	B1 B1ft, B1 (3) B1ft (1) Total 4 marks
3.	(a) $y = 5 - (2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

Question number	Scheme	Marks
4.	(a) $\frac{dy}{dx} = 4x + 18x^{-4}$ M1: $x^2 \rightarrow x$ or $x^{-3} \rightarrow x^{-4}$ (b) $\frac{2x^3}{3} - \frac{6x^{-2}}{-2} + C$ M1: $x^2 \rightarrow x^3$ or $x^{-3} \rightarrow x^{-2}$ or $+C$ $\left(= \frac{2x^3}{3} + 3x^{-2} + C \right)$ First A1: $\frac{2x^3}{3} + C$ Second A1: $-\frac{6x^{-2}}{-2}$	M1 A1 (2) M1 A1 A1 (3) Total 5 marks
5.	(a) $3\sqrt{5}$ (or $a = 3$) (b) $\frac{2(3+\sqrt{5})}{(3-\sqrt{5})} \times \frac{(3+\sqrt{5})}{(3+\sqrt{5})}$ $(3-\sqrt{5})(3+\sqrt{5}) = 9-5$ (= 4) (Used as or intended as denominator) $(3+\sqrt{5})(p \pm q\sqrt{5}) = \dots$ 4 terms ($p \neq 0, q \neq 0$) (Independent) or $(6+2\sqrt{5})(p \pm q\sqrt{5}) = \dots$ 4 terms ($p \neq 0, q \neq 0$) [Correct version: $(3+\sqrt{5})(3+\sqrt{5}) = 9+3\sqrt{5}+3\sqrt{5}+5$, or double this.] $\frac{2(14+6\sqrt{5})}{4} = 7+3\sqrt{5}$ 1st A1: $b = 7$, 2nd A1: $c = 3$	B1 (1) M1 B1 M1 A1 A1 (5) Total 6 marks

Question number	Scheme	Marks
6.	(a)  (See below) Clearly through origin (or (0, 0) seen) 3 labelled (or (3, 0) seen) (b)  Stretch parallel to y-axis 1 and 4 labelled (or (1, 0) and (4, 0) seen) 6 labelled (or (0, 6) seen) (c)  Stretch parallel to x-axis 2 and 8 labelled (or (2, 0) and (8, 0) seen) 3 labelled (or (0, 3) seen)	M1 A1 A1 (3) M1 A1 A1 (3) M1 A1 A1 (3) Total 9 marks
7.	(a) $500 + (500 + 200) = 1200$ or $S_2 = \frac{1}{2} 2\{1000 + 200\} = 1200$ (*) (b) Using $a = 500$, $d = 200$ with $n = 7, 8$ or 9 $a + (n - 1)d$ or “listing” $500 + (7 \times 200) = (\text{£})1900$ (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 $= (\text{£}) 9600$ (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	B1 (1) M1 A1 (2) M1 A1 (3) M1 A1 M1 A1 M1 A1cso,A1cso (7) Total 13 marks

Question number	Scheme	Marks
8.	$\frac{5x^2 + 2}{x^{\frac{1}{2}}} = 5x^{\frac{3}{2}} + 2x^{-\frac{1}{2}}$ M1: One term correct. A1: Both terms correct, and no extra terms. $f(x) = 3x + \frac{5x^{\frac{5}{2}}}{\left(\frac{5}{2}\right)} + \frac{2x^{\frac{1}{2}}}{\left(\frac{1}{2}\right)} (+C) \quad (+C \text{ not required here})$ $6 = 3 + 2 + 4 + C \quad \text{Use of } x = 1 \text{ and } y = 6 \text{ to form eqn. in } C$ $C = -3$ $3x + 2x^{\frac{5}{2}} + 4x^{\frac{1}{2}} - 3 \quad (\text{simplified version required})$ [or: $3x + 2\sqrt{x^5} + 4\sqrt{x} - 3$ or equiv.]	M1 A1 M1 A1ft M1 A1cso A1 (ft C) (7) Total 7 marks
9.	(a) -2 (P), 2 (Q) $(\pm 2 \text{ scores B1 B1})$ (b) $y = x^3 - x^2 - 4x + 4$ (May be seen earlier) $\text{Multiply out, giving 4 terms}$ $\frac{dy}{dx} = 3x^2 - 2x - 4 \quad (*)$ (c) At $x = -1$: $\frac{dy}{dx} = 3(-1)^2 - 2(-1) - 4 = 1$ Eqn. of tangent: $y - 6 = 1(x - (-1)), \quad y = x + 7 \quad (*)$ (d) $3x^2 - 2x - 4 = 1$ (Equating to “gradient of tangent”) $3x^2 - 2x - 5 = 0 \quad (3x - 5)(x + 1) = 0 \quad x = \dots$ $x = \frac{5}{3} \text{ or equiv.}$ $y = \left(\frac{5}{3} - 1\right)\left(\frac{25}{9} - 4\right), \quad = \frac{2}{3} \times \left(-\frac{11}{9}\right) = -\frac{22}{27} \text{ or equiv.}$	B1, B1 (2) M1 M1 A1cso (3) M1 A1cso (2) M1 M1 A1 M1, A1 (5) Total 12 marks

Question number	Scheme	Marks
10.	(a) $x^2 + 2x + 3 = (x+1)^2 + 2$ $(a = 1, b = 2)$ (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 (d) $b^2 - 4ac = k^2 - 12$ (May be within the quadratic formula) $k^2 - 12 < 0$ (Correct inequality expression in any form) $-\sqrt{12} < k < \sqrt{12}$ (or $-2\sqrt{3} < k < 2\sqrt{3}$)	B1, B1 (2) M1 A1ft B1 (3) B1 B1 (2) M1 A1 M1 A1 (4) Total 11 marks