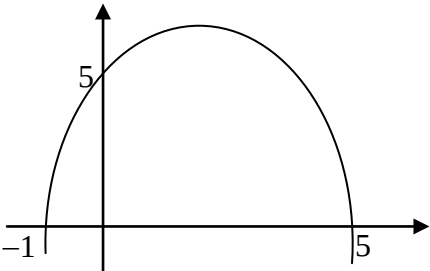


Question number	Scheme	Marks
1. (a)	$u_2 = \sqrt{\left(\frac{3}{2} + \frac{20}{3}\right)} = 2.85773\dots = 2.86$ $u_3 = 2.90300\dots = 2.90$ $u_4 = 2.88806\dots = 2.89$ [If $u_3 = \text{AWRT } 2.90$ and $u_4 = \text{AWRT } 2.89$ penalise once only]	M1 A1 c.a.o A1 c.a.o (3)
(b) (i)	$3 = \sqrt{\left(\frac{3}{2} + \frac{a}{3}\right)}$ or $9 = \frac{3}{2} + \frac{a}{3}$ $\frac{a}{3} = 9 - \frac{3}{2}$ or $a = 3\left(9 - \frac{3}{2}\right)$ $a = 22.5$	M1 M1 A1 (3)
(ii)	(If $u_1 = u_2$, then $u_2 = u_3, \dots$) $u_5 = 3$	B1 (1) (7 marks)
2. (a)	$b^2 - 4ac \geq 0$ $(5k)^2 - 8k \geq 0$, $k(25k - 8) \geq 0$ *	M1 A1 (2)
(b)	Critical values: $k = 0$, $k = \frac{8}{25}$ $k \leq 0$, $k \geq \frac{8}{25}$ 	B1 B1 M1 A1 ft (4)
(c)	$k = 0$, $k = \frac{8}{25}$ (Clearly seen as a soln. for (C))	B1 (1) (7 marks)
3. (a)	$3^x = 3^{2(y-1)}$ $x = 2(y-1)$ (*)	M1 A1 (2)
(b)	$(2y - 2)^2 = y^2 + 7$, $3y^2 - 8y - 3 = 0$ $(3y + 1)(y - 3) = 0$, $y = \dots$ (or correct substitution in formula) $y = -\frac{1}{3}$, $y = 3$ $x = -\frac{8}{3}$, $x = 4$	M1, A1 M1 A1 M1 A1ft (6) (8 marks)

Question number	Scheme	Marks
4. (a)	$\sqrt[3]{8} = 2\sqrt[3]{2}$ seen or used somewhere (possibly implied). $\frac{12}{\sqrt[3]{8}} = \frac{12\sqrt[3]{8}}{8}$ or $\frac{12}{2\sqrt[3]{2}} = \frac{12\sqrt[3]{2}}{4}$ Direct statement, e.g. $\frac{6}{\sqrt[3]{2}} = 3\sqrt[3]{2}$ (no indication of method) is M0.	B1 M1
	At $x = 8$, $\frac{dy}{dx} = 3\sqrt[3]{8} + \frac{12}{\sqrt[3]{8}} = 6\sqrt[3]{2} + 3\sqrt[3]{2} = 9\sqrt[3]{2}$ (*)	A1 (3)
(b)	Integrating: $\frac{3x^{3/2}}{\left(\frac{3}{2}\right)} + \frac{12x^{1/2}}{\left(\frac{1}{2}\right)} (+C)$ (C not required)	M1 A1 A1
	At (4, 30), $\frac{3 \times 4^{3/2}}{\left(\frac{3}{2}\right)} + \frac{12 \times 4^{1/2}}{\left(\frac{1}{2}\right)} + C = 30$ (C required)	M1
	$(f(x) =) 2x^{3/2} + 24x^{1/2}, -34$	A1, A1 (6)
		(9 marks)
5. (a)	$m = \frac{2-6}{12-4} \left(= -\frac{1}{2} \right)$	M1 A1
	$y - 6 = (\text{their } m)(x - 4)$ $x + 2y = 16$	M1 A1 (4)
(b)	$y = -4x$	B1 (1)
(c)	$x + 2(-4x) = 16$ $-7x = 16$ $x = -\frac{16}{7}$	M1 A1
	$y = \frac{64}{7}$	A1 ft
	$A(4, 6), C\left(-\frac{16}{7}, \frac{64}{7}\right): \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right) \rightarrow \left(\frac{6}{7}, \frac{53}{7}\right)$	M1 A1 ft (5)
		(10 marks)

Question number	Scheme	Marks
6. (a)	9	B1 (1)
(b)	 Shape Position of max. 5 on y-axis -1 and 5 on x-axis	B1 B1 B1 M1 A1 (5)
(c)	Gradient: $\frac{8 - (-7)}{3 - (-2)}$ $y - 8 = \text{"gradient"} (x - 3)$ $y = 3x - 1$	M1 A1 M1 A1 (4)
(d)	Where $y = 0$, $x = \frac{1}{3}$	M1 A1ft (2)
(e)	Mid point: $\left(\frac{-7+8}{2}, \frac{-2+3}{2}\right) = \left(\frac{1}{2}, \frac{1}{2}\right)$ $k = 1$	M1 A1 (2)
		(14 marks)
7. (a)	$\frac{dy}{dx} = 4x^3 - 16x$	M1 A1 (2)
(b)	$4x^3 - 16x = 0$ $4x(x^2 - 4) = 0$ $x = 0, 2, -2$ $y = 3, -13, -13$	M1 A2 (1, 0) M1 A1 (5)
		(7 marks)
8. (a)	$(x^4 - 6x^2 + 9)$	M1
	$(x^4 - 6x^2 + 9) \div x^3 = x - 6x^{-1} + 9x^{-3}$ (*)	A1 (2)
(b)	$f'(x) = 1 + 6x^{-2} - 27x^{-4}$ First A1: 2 terms correct (unsimplified) Second A1: all 3 correct (simplified)	M1 A1 A1 (3)
		(5 marks)