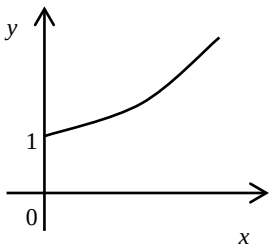
Question number	Scheme	Marks
1. (*a*)	$p+6+12+q=-\frac{1}{8}p+\frac{6}{4}-6+q$	M1 , M1
	$\therefore \frac{9}{8}p=-22\frac{1}{2}$	M1
	$p=-20$	A1 (4)
(*b*)	Remainder = $p + q + 18 = p + 21$ (=1)	B1√ ft on p (1)
		(5 marks)
2. (*a*)	$4x+9, \quad +12\sqrt{x}$	B1, B1 (2)
(*b*)	$\int\left(4x+12x^{1/2}+9\right)dx=2x^2+8x^{3/2}+9x$ (dep. on 3 terms)	M1
	$[\ldots\ldots]_1^2=\left(8+(8\times 2^{3/2})+18\right)-(2+8+9)$	M1 A1
	$=7+16\sqrt{2}$	M1 A1 (5)
		(7 marks)
3. (*a*)	 Shape	B1
	domain, intercept	B1 (2)
(*b*)	£800 × 1.04^10 ≈ £1184	M1 A1 (2)
(*c*)	$1.04^x=2$	M1
	$x=\frac{\ln 2}{\ln 1.04}\approx 18$ (years)	M1 A1 (3)
		(7 marks)

Question number		Scheme	Marks
4.	(*a*)	$\frac{1}{2}r^2\theta = \frac{1}{2}\times 6.5^2 \times 0.8 = 16.9$ (a.w.r.t. if changed to degrees)	M1 A1 (2)
	(*b*)	$\sin 0.4 = \frac{x}{6.5}$, x = 6.5 sin 0.4 , (where x is half of AB) (n.b. 0.8 rad = 45.8°)	M1, A1
		$AB = 2x = 5.06$ (a.w.r.t.) (*)	A1 (3)
	(*c*)	$r\theta + 5.06 = (6.5\times 0.8) + 5.06 = 10.26$ (a.w.r.t) (or 10.3)	M1 A1 (2)
			(7 marks)
5.		$1 + nax, + \frac{n(n-1)}{2}(ax)^2 + \frac{n(n-1)(n-2)}{6}(ax)^3 + \ldots$ accept 2!, 3!	B1, B1 (2)
		$na = 8,\ \frac{n(n-1)}{2}a^2 = 30$	M1
		$\frac{n(n-1)}{2}\cdot\frac{64}{n^2} = 30,\ \frac{\frac{s}{a}\left(\frac{s}{a}-1\right)a^2}{2} = 30$	M1
		n = 16, $a = \frac{1}{2}$	A1, A1 (4)
		$\frac{16.15.14}{6}\cdot\left(\frac{1}{2}\right)^3 = 70$	M1 A1 (2)
			(8 marks)
6.	(*a*)	$V = \pi r^2 h = 500,\quad A = 2\pi rh + \pi r^2$	B1, M1
		$A = 2\pi r\left(\frac{500}{\pi r^2}\right) + \pi r^2 = \pi r^2 + \frac{1000}{r}$	M1 A1 (4)
	(*b*)	$\frac{dA}{dr} = 2\pi r - 1000r^{-2}$	M1 A1
		$2\pi r - 1000r^{-2} = 0$ r = $\sqrt[3]{\frac{500}{\pi}}$ (≈ 5.42)	M1 A1 (4)
	(*c*)	$\frac{d^2A}{dr^2} = 2\pi + 2000r^{-3},\quad > 0$ therefore minimum	M1 A1 ft (2)
	(*d*)	$A = \pi r^2 + \frac{1000}{r} = 277$ (nearest integer)	M1 A1 (2)
			(12 marks)

Question number		Scheme	Marks
7.	(a)	$x(x^2 - 6x + 5)$	M1
		$= x(x - 1)(x - 5)$	M1 A1 (3)
	(b)	1 and 5	B1 ft (1)
	(c)	$\frac{dy}{dx} = 3x^2 - 12x + 5$	M1 A1
		At $x = 1$. $\frac{dy}{dx} = 3 - 12 + 5 = -4$	A1 (3)
		$\int \left(x^3 - 6x^2 + 5x\right)dx = \frac{x^4}{4} - \frac{6x^3}{3} + \frac{5x^2}{2}$	M1 A1
		$\left[\ldots\ldots\right]_0^1 = \frac{1}{4} - 2 + \frac{5}{2} \quad \left(= \frac{3}{4}\right) \quad R$	M1 A1 ft
		Evaluating at 5: $\frac{625}{4} - 250 + \frac{125}{2} \quad \left(= -31\frac{1}{4}\right)$	A1
		To find S: $-31\frac{1}{4} - \frac{3}{4} = -32$	M1
	(d)	Total Area = $32 + \frac{3}{4} = 32\frac{3}{4}$	A1 (7)
			(14 marks)
8.	(*a*)	$\frac{dy}{dx} = 3x^2 - 14x + 15$	M1 A1 (2)
	(*b*)	$3x^2 - 14x + 15 = 0$	M1
		$(3x - 5)(x - 3) = 0 \quad x = ..., \ 3$ (A1 requires <u>correct</u> quadratic factors).	M1, A1
		$y = 12$ (Following from $x = 3$)	A1 (4)
	(*c*)	P: $x = 1 \quad y = 12$	B1
		Same y-coord. as Q (or "zero gradient"), so PQ is parallel to the x-axis	B1 (2)
	(*d*)	$\int \left(x^3 - 7x^2 + 15x + 3\right)dx = \frac{x^4}{4} - \frac{7x^3}{3} + \frac{15x^2}{2} + 3x$	M1 A1 A1
		(First A1: 3 terms correct, Second A1: all correct)	
		$\left[\frac{x^4}{4} - \frac{7x^3}{3} + \frac{15x^2}{2} + 3x\right]_1^3 = \left(\frac{81}{4} - 63 + \frac{135}{2} + 9\right) - \left(\frac{1}{4} - \frac{7}{3} + \frac{15}{2} + 3\right)$	M1
		$\left(33\frac{3}{4} - 8\frac{5}{12}\right) - 24 = 25\frac{1}{3} - (2 \times 12) = 1\frac{1}{3}$ (or equiv. or 3 s.f or better)	M1 A1 (6)
			(14 marks)