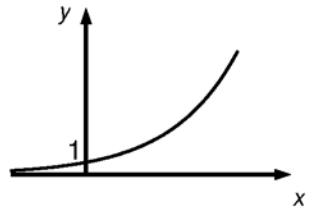
4752 (C2) Concepts for Advanced Mathematics

1		½ x^2 + 3x^{-1} + c o.e.	3	1 for each term	3
2	**(i)**	5 with valid method	1	eg sequence has period of 4 nos.	
	(ii)	165 www	2	M1 for 13× (1 + 3 + 5 + 3) + 1 + 3 +5 or for 14 × (1 + 3 + 5 + 3) − 3	3
3		rt angled triangle with √2 on one side and 3 on hyp Pythag. used to obtain remaining side = √7 tan θ = $\frac{opp}{adj} = \frac{\sqrt{2}}{\sqrt{7}}$ o.e.	1 1 1	or M1 for $\cos^2\theta = 1 - \sin^2\theta$ used A1 for $\cos\theta = \frac{\sqrt{7}}{\sqrt{9}}$ A1 for $\tan\theta = \frac{\sin\theta}{\cos\theta} = \frac{\sqrt{2}}{\sqrt{7}}$ o.e.	3
4		radius = 6.5 [cm]	3	M1 for ½ × r^2 × 0.4 [= 8.45] o.e. and M1 for $r^2 = \frac{169}{4}$ o.e. [= 42.25]	3
5	**(i)**	sketch of correct shape with P (−0.5,2) Q (0,4) and R (2,2)	2	1 if Q and one other are correct	
	(ii)	sketch of correct shape with P (−1,0.5) Q (0,1) and R (4,0.5)	2	1 if Q and one other are correct	4
6	**(i)**	205	3	M1 for AP identified with d = 4 and M1 for 5 + 50 d used	
	(ii)	$\frac{25}{3}$ o.e.	2	M1 for $r = \frac{2}{5}$ o.e.	5
7	**(i)**	$\frac{\sin A}{5.6} = \frac{\sin 79}{8.4}$ s.o.i. [A =] 40.87 to 41	M1 A1		
	(ii)	[BC^2 =] $5.6^2 + 7.8^2 - 2 \times 5.6 \times 7.8 \times$ cos ("180-79") = 108.8 to 108.9 [BC =] 10.4(…)	M1 A1 A1		5
8		$y' = 3x^{-\frac{1}{2}}$ ¾ when x = 16 y = 24 when x = 16 y − their 24 = their ¾ (x − 16) y − 24 = ¾ (x − 16) o.e.	M1 A1 B1 M1 A1	condone if unsimplified dependent on $\frac{dy}{dx}$ used for m	5

9	**(i)**		G1 DG1	for curve of correct shape in both quadrants must go through (0, 1) shown	
	(ii)	$2x + 1 = \frac{\log 10}{\log 3}$ o.e. $[x =]$ 0.55	M1 A2	or M1 for $2x + 1 = \log_3 10$ A1 for other versions of 0.547…or 0.548	5
10	**(i)**	$3x^2 - 6x - 9$ use of their $y' = 0$ $x = -1$ $x = 3$ valid method for determining nature of turning point max at $x = -1$ and min at $x = 3$	M1 M1 A1 A1 M1 A1	 c.a.o.	 6
	(ii)	$x(x^2 - 3x - 9)$ $\frac{3 \pm \sqrt{45}}{2}$ or $(x - \frac{3}{2})^2 = 9 + \frac{9}{4}$ 0, $\frac{3}{2} \pm \frac{\sqrt{45}}{2}$ o.e.	M1 M1 A1	 	 3
	(iii)	sketch of cubic with two turning points correct way up x-intercepts – negative, 0, positive shown	G1 DG1	 	 2
11	**(i)**	47.625 [m^2] to 3 sf or more, with correct method shown	4	M3 for $\frac{1.5}{2} \times (2.3 + 2 + 2[2.7 + 3.3 + 4 + 4.8 + 5.2 + 5.2 + 4.4])$	4
	(ii)	43.05	2	M1 for $1.5 \times (2.3+2.7+3.3+4+4.8+5.2+4.4+2)$	2
	(iii)	$-0.013x^4/4 + 0.16x^3/3 - 0.082x^2/2 + 2.4x$ o.e. their integral evaluated at $x = 12$ (and 0) only 47.6 to 47.7	M2 M1 A1	M1 for three terms correct dep on integration attempted 	 4
	(iv)	5.30.. found compared with 5.2 s.o.i.	1 D1	 	 2
12	**(i)**	$\log P = \log a + bt$ www comparison with $y = mx + c$ s.o.i. intercept = $\log_{10} a$	1 1 1	 must be with correct equation dependent on correct equation	 3
	(ii)	[2.12, 2.21], 2.32, 2.44, 2.57, 2.69 plots ft ruled line of best fit	1 1 1	 Between (10, 2.08) and (10, 2.12)	 3

	(iii)	$0.0100 \leq m < 0.0125$	B2	M1 for $\frac{y - \text{step}}{x - \text{step}}$	
		$a = 10^c$ or $\log a = c$	B1	$1.96 \leq c \leq 2.02$	
		$P = 10^c \times 10^{mt}$ or $10^{mt + c}$	B1	f.t. their m and a	4
	(iv)	use of $t = 105$	B1		
		1.0 – 2.0 billion approx	B1		
		unreliable since extrapolation o.e.	E1		3