4752 (C2) Concepts for Advanced Mathematics

Section A

1	$4x^5$ $-12x^{-\frac{1}{2}}$ $+ c$	1 2 1	 M1 for other $kx^{-\frac{1}{2}}$	4
2	95.25, 95.3 or 95	4	M3 ½×5×(4.3+0+2[4.9+4.6+3.9+2.3+1.2]) M2 with 1 error, M1 with 2 errors. Or M3 for 6 correct trapezia.	4
3	1.45 o.e.	2	M1 for $\frac{1}{2}+\frac{1}{3}+\frac{1}{4}+\frac{1}{5}+\frac{1}{6}$ oe	2
4	105 and 165	3	B1 for one of these or M1 for $2x = 210$ or 330	3
5	(i) graph along $y = 2$ with V at (3,2) (4,1) & (5,2) (ii) graph along $y = 6$ with V at (1,6) (2,3) & (3,6)	2 2	M1 for correct V, or for f(x+2) B1 for (2,k) with all other elements correct	4
6	(i) 54.5 (ii) Correct use of sum of AP formula with n = 50, 20, 19 or 21 with their d and a = 7 eg S_{50} = 3412.5, S_{20} = 615 Their $S_{50} - S_{20}$ dep on use of ap formula 2797.5 c.a.o.	2 M1 M1 A1	B1 for $d = 2.5$ <u>or</u> M2 for correct formula for S_{30} with their d M1 if one slip	5
7	$8x - x^{-2}$ o.e. their $\frac{dy}{dx} = 0$ correct step x = ½ c.a.o.	2 M1 DM1 A1	B1 each term s.o.i. s.o.i.	5
8	(i) 48 geometric, or GP (ii) mention of $\|r\| < 1$ condition o.e. S = 128	1 1 1 2	 M1 for $\frac{192}{1--\frac{1}{2}}$	5
9	(i) 1 (ii) (A) 3.5 $\log_a x$ (ii) (B) $-\log_a x$	1 2 1	 M1 for correct use of 1st or 3rd law	4

Section B

10	**i**	$7 - 2x$ $x = 2$, gradient = 3 $x = 2$, $y = 4$ y – their 4 = their grad $(x - 2)$ subst $y = 0$ in their linear eqn completion to $x = \frac{2}{3}$ (ans given)	M1 A1 B1 M1 M1 A1	differentiation must be used or use of y = their $mx + c$ and subst (2, their 4), dependent on diffn seen	6
	ii	f(1) = 0 or factorising to $(x - 1)(6 - x)$ or $(x - 1)(x - 6)$ 6 www	1 1	or using quadratic formula correctly to obtain $x = 1$	2
	iii	$\frac{7}{2}x^2 - \frac{1}{3}x^3 - 6x$ value at 2 − value at 1 $2\frac{1}{6}$ or 2.16 to 2.17 $\frac{1}{2} \times \frac{4}{3} \times 4$ − their integral 0.5 o.e.	M1 M1 A1 M1 A1	for two terms correct; ignore $+c$ ft attempt at integration only	5
11	**i(**A)	150 (cm) or 1.5 m	2	M1 for 2.5×60 or 2.5×0.6 or for 1.5 with no units	2
	i(B)	½ × 60^2 × 2.5 or 4500 ½ × 140^2 × 2.5 or 24 500 subtraction of these 20 000 (cm^2) isw	M1 M1 DM1 A1	or equivalents in m^2 or 2 m^2	4
	ii(A)	attempt at use of cosine rule $\cos \text{EFP} = \frac{3.5^2 + 2.8^2 - 1.6^2}{2 \times 2.8 \times 3.5}$ o.e. 26.5 to 26.65 or 27	M1 M1 A1	condone 1 error in substitution	3
	ii(B)	2.8 sin (their EFP) o.e. 1.2 to 1.3 [m]	M1 A1		2

12	**i**	$\log a + \log (b^t)$ www clear use of $\log (b^t) = t \log b$ dep	B1 B1	condone omission of base throughout question	2
	ii	(2.398), 2.477, 2.556 , 2.643, 2.724 points plotted correctly f.t. ruled line of best fit f.t.	T1 P1 1	 On correct square 	3
	iii	$\log a = 2.31$ to 2.33 $a = 204$ to 214 $\log b = 0.08$ approx $b = 1.195$ to 1.215	M1 A1 M1 A1	ft their intercept ft their gradient 	4
	iv	eg £210 million dep	1	their £a million	1
	v	$\frac{\log 1000 - \text{their intercept}}{\text{their gradient}} \approx \frac{3 - 2.32}{0.08}$ = 8.15 to 8.85	M1 A1	 or B2 from trials	2