4752 (C2) Concepts for Advanced Mathematics

Section A

1	210 c.a.o.	2	1 for π rads = 180° soi	2
2	(i) 5.4×10^{-3}, 0.0054 or $\dfrac{27}{5000}$ (ii) 6 www	1 2	M1 for S = 5.4 / (1 − 0.1)	3
3	stretch, parallel to the y axis, sf 3	2	1 for stretch plus one other element correct	2
4	[f′(x) =] $12 - 3x^2$ their f′(x) > 0 or = 0 soi $-2 < x < 2$	B1 M1 A1	condone $-2 \le x \le 2$ or "between -2 and 2"	3
5	(i) grad of chord = $(2^{3.1} - 2^3)/0.1$ o.e. = 5.74 c.a.o. (ii) correct use of A and C where for C, $2.9 < x < 3.1$ answer in range (5.36, 5.74)	M1 A1 M1 A1	or chord with ends x = 3 ± h, where 0 < h ≤ 0.1 s.c.1 for consistent use of reciprocal of gradient formula in parts (i) and (ii)	4
6	[y =] $kx^{3/2}$ [+ c] k = 4 subst of (9, 105) in their eqn with c or $c = -3$	M1 A1 M1 A1	may appear at any stage must have c; must have attempted integration	4 **18**
7	sector area = 28.8 or $\dfrac{144}{5}$ [cm^2] c.a.o. area of triangle = $\frac{1}{2} \times 6^2 \times \sin 1.6$ o.e. their sector − their triangle s.o.i. 10.8 to 10.81 [cm^2]	2 M1 M1 A1	M1 for $\frac{1}{2} \times 6^2 \times 1.6$ must both be areas leading to a positive answer	5
8	$a + 10d = 1$ *or* $121 = 5.5(2a+10d)$ $5(2a + 9d) = 120$ o.e. $a = 21$ s.o.i. www and $d = -2$ s.o.i. www 4th term is 15	M1 M1 A1 A1 A1	or $121 = 5.5(a + 1)$ gets M2 eg $2a + 9d = 24$	5
9	$x \log 5 = \log 235$ or $x = \dfrac{\log 235}{\log 5}$ 3.39	M1 A2	or $x = \log_5 235$ A1 for 3.4 or versions of 3.392…	3
10	$2(1 - \cos^2 \theta) = \cos \theta + 2$ $- 2\cos^2 \theta = \cos \theta$ s.o.i. valid attempt at solving their quadratic in $\cos \theta$ $\cos \theta = -\frac{1}{2}$ www $\theta = 90, 270, 120, 240$	M1 A1 DM1 A1 A1	for $1 - \cos^2 \theta = \sin^2 \theta$ substituted graphic calc method: allow M3 for intersection of $y = 2 \sin^2 \theta$ and $y = \cos \theta + 2$ and A2 for all four roots. All four answers correct but unsupported scores B2. 120 and 240 only: B1.	5 **18**

Section B

11	i	$(x + 5)(x − 2)(x + 2)$	2	M1 for $a (x + 5)(x − 2)(x + 2)$	2
	ii	$[(x + 2)](x^2 + 3x − 10)$	M1	for correct expansion of one pair of their brackets	
		$x^3 + 3x^2 − 10x + 2x^2 + 6x − 20$ o.e.	M1	for clear expansion of correct factors – accept given answer from $(x + 5)(x^2 − 4)$ as first step	2
	iii	$y' = 3x^2 + 10x − 4$ their $3x^2 + 10x − 4 = 0$ s.o.i. $x = 0.36…$ from formula o.e.	M2 M1 A1	M1 if one error or M1 for substitution of 0.4 if trying to obtain 0, and A1 for correct demonstration of sign change	6
		$(−3.7, 12.6)$	B1+1		
	iv	$(-1.8, 12.6)$	B1+1	accept $(−1.9, 12.6)$ or f.t.(½ their max x, their max y)	2
12	i	Area = (-)0.136 seen [m²] www	4	M3 for $0.1/2 \times (0.14 + 0.16 + 2[0.22 + 0.31 + 0.36 + 0.32])$ M2 for one slip; M1 for two slips	
		Volume = 0.34 [m³] or ft from their area × 2.5	1	must be positive	5
	ii	$2x^4 − x^3 − 0.25 x^2 − 0.15x$ o.e. value at 0.5 [− value at 0] = −0.1375 area of cross section (of trough) or area between curve and x-axis 0.34375 r.o.t. to 3 or more sf [m³] m³ seen in (i) or (ii)	M2 M1 A1 E1 B1 U1	M1 for 2 terms correct dep on integral attempted must have neg sign	7
13	i	$\log P = \log a + b \log t$ www comparison with $y = mx + c$ intercept = $\log_{10} a$	1 1 1	must be with correct equation condone omission of base	3
	ii	log t 0 0.78 1.15 1.18 1.20 log P 1.49 1.64 1.75 1.74 1.76 plots f.t. ruled line of best fit	1 1 1 1	accept to 2 or more dp	4
	iii	gradient rounding to 0.22 or 0.23 $a = 10^{1.49}$ s.o.i. $P = 31t^m$ allow the form $P = 10^{0.22\log t +1.49}$	2 1 1	M1 for y step / x-step accept 1.47 − 1.50 for intercept accept answers that round to 30 – 32 , their positive m	4
	iv	answer rounds in range 60 to 63	1		1