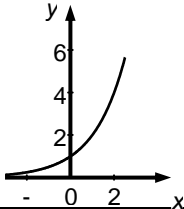


4752 (C2) Concepts for Advanced Mathematics

Section A

1	$40x^3$	2	-1 if extra term	2
2	(i) 3 (ii) 141	1 2	M1 for $9 \times (1 + 2 + 3 + 4 + 5) + 1 + 2 + 3$	3
3	right angled triangle with 1 and 2 on correct sides Pythagoras used to obtain hyp = $\sqrt{5}$ $\cos \theta = \frac{a}{h} = \frac{2}{\sqrt{5}}$	M1 M1 A1	or M1 for $\sin \theta = \frac{1}{2} \cos \theta$ and M1 for substituting in $\sin^2 \theta + \cos^2 \theta = 1$ E1 for sufficient working	3
4	(i) line along $y = 6$ with V (1, 6), (2, 2), (3, 6) (ii) line along $y = 3$ with V (-2, 3), (-1, 1), (0, 3)	2 2	1 for two points correct 1 for two points correct	4
5	$2x^6 + \frac{3}{4}x^{\frac{4}{3}} + 7x + c$	5	1 for $2x^6$; 2 for $\frac{3}{4}x^{\frac{4}{3}}$ or 1 for other $kx^{\frac{4}{3}}$; 1 for $7x$; 1 for $+c$	5
6	(i) correct sine shape through O amplitude of 1 and period 2π shown (ii) $7\pi/6$ and $11\pi/6$	1 1 3	B2 for one of these; 1 for $-\pi/6$ found	5
7	(i) 60 (ii) -6 (iii) 	2 1 1 1	M1 for $2^2 + 2^3 + 2^4 + 2^5$ o.e. Correct in both quadrants Through (0, 1) shown dep.	5
8	$r = 1/3$ s.o.i. $a = 54$ or ft $18 \div$ their r $S = \frac{a}{1-r}$ used with $-1 < r < 1$ $S = 81$ c.a.o.	2 M1 M1 A1	1 mark for $ar = 18$ and $ar^3 = 2$ s.o.i.	5
9	(i) 0.23 c.a.o. (ii) 0.1 or $1/10$ (iii) $4(3x + 2)$ or $12x + 8$ (iv) $[y =] 10^{3x+2}$ o.e.	1 1 1 1	10^{-1} not sufficient	4

Section B

10	i	$h = 120/x^2$ $A = 2x^2 + 4xh$ o.e. completion to given answer	B1 M1 A1	at least one interim step shown	3
	ii	$A' = 4x - 480/x^2$ o.e. $A'' = 4 + 960/x^3$	2 2	1 for kx^2 o.e. included ft their A' only if kx^2 seen ; 1 if one error	4
	iii	use of $A' = 0$ $x = \sqrt[3]{120}$ or 4.9(3..) Test using A' or A'' to confirm minimum Substitution of their x in A $A = 145.9$ to 146	M1 A1 T1 M1 A1	Dependent on previous M1	5
11	iA	$BC^2 = 348^2 + 302^2 - 2 \times 348 \times 302 \times \cos 72^\circ$ $BC = 383.86\dots$ $1033.86\dots$ [m] or ft $650 +$ their BC	M2 A1 1	M1 for recognisable attempt at Cosine Rule to 3 sf or more accept to 3 sf or more	4
	iB	$\frac{\sin B}{302} = \frac{\sin 72}{\text{their } BC}$ $B = 48.4\dots$ $355 -$ their B o.e. answer in range 306 to 307	M1 A1 M1 A1	Cosine Rule acceptable or Sine Rule to find C or $247 +$ their C	4
	ii	Arc length PQ = $\frac{224}{360} \times 2\pi \times 120$ o.e. or 469.1... to 3 sf or more QP = 222.5... to 3 sf or more answer in range 690 to 692 [m]	M2 B1 A1	M1 for $\frac{136}{360} \times 2\pi \times 120$	4
12	iA	$x^4 = 8x$ (2, 16) c.a.o. PQ = 16 and completion to show $\frac{1}{2} \times 2 \times 16 = 16$	M1 A1 A1	NB answer 16 given	3
	iB	$x^5/5$ evaluating their integral at their co-ord of P and zero [or $32/5$ o.e.] 9.6 o.e.	M1 M1 A1	ft only if integral attempted, not for x^4 or differentiation c.a.o.	3
	iiA	$6x^2h^2 + 4xh^3 + h^4$	2	B1 for two terms correct.	2
	iiB	$4x^3 + 6x^2h + 4xh^2 + h^3$	2	B1 for three terms correct	2
	iiC	$4x^3$	1		1
	iiD	gradient of [tangent to] curve	1		1