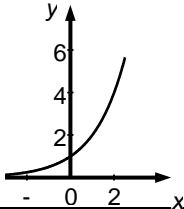


4752 (C2) Concepts for Advanced Mathematics

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 |