

Question Number	Scheme		Marks
3.(a)	OPEN TOPPED $120 = 3x^2y \Rightarrow y = \frac{40}{x^2}$ $A = 3x^2 + 8xy$ $= 3x^2 + 8x \times \frac{40}{x^2} = 3x^2 + \frac{320}{x}$	CLOSED CONTAINER $120 = 3x^2y \Rightarrow y = \frac{40}{x^2}$ $A = 6x^2 + 8xy$ $= 6x^2 + 8x \times \frac{40}{x^2} = 6x^2 + \frac{320}{x}$	M1, A1 dM1, A1 (4)
(b)	$\frac{dA}{dx} = 6x - \frac{320}{x^2}$ $\frac{dA}{dx} = 6x - \frac{320}{x^2} = 0$ $\Rightarrow x^3 = \frac{160}{3} \Rightarrow x = \text{awrt } 3.76$	$\frac{dA}{dx} = 12x - \frac{320}{x^2}$ $\frac{dA}{dx} = 12x - \frac{320}{x^2} = 0$ $\Rightarrow x^3 = \frac{80}{3} \Rightarrow x = \text{awrt } 2.99$	M1, A1ft dM1, A1 (4)
(c)	Attempts $\left. \frac{d^2A}{dx^2} \right _{x=3.76} = 6 + \frac{640}{x^3}$ $= 6 + \frac{640}{3.76^3} = ..$ $\left. \frac{d^2A}{dx^2} \right _{x=3.76} = \text{awrt } 18 > 0 \text{ MINIMUM*}$	Attempts $\left. \frac{d^2A}{dx^2} \right _{x=2.99} = 12 + \frac{640}{x^3}$ $= 12 + \frac{640}{2.99^3} = ..$ $\left. \frac{d^2A}{dx^2} \right _{x=2.99} = \text{awrt } 36 > 0 \text{ MINIMUM*}$	M1 A1* (2)
			(10 marks)

Question Number	Scheme	Marks
10.(a)	$x = 2, y = 5 \Rightarrow 5 = 8a - 12 + 6 + b$ $\frac{dy}{dx} = 3ax^2 - 6x + 3$ AND $x = 2, \frac{dy}{dx} = 7 \Rightarrow 7 = 12a - 12 + 3$ Solves $11 = 8a + b$ and $7 = 12a - 9 \Rightarrow a = \frac{4}{3}, b = \frac{1}{3}$	M1 M1 A1 A1 (4)
(b)	Sets $\frac{dy}{dx} = 3ax^2 - 6x + 3 = 0$ with their value of a and b $4x^2 - 6x + 3 = 0$ and attempts " $b^2 - 4ac$ " $b^2 - 4ac = -12 < 0$ hence there are no turning points oe	M1 dM1 A1* (3) (7 marks)

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4	$\int (2x^2 + 7) dx = \frac{2}{3}x^3 + 7x \quad \text{or} \quad \int (10 - 2x^2) dx = 10x - \frac{2}{3}x^3$ Achieves/uses a limit of $\sqrt{5}$ $\text{Area} = 17\sqrt{5} - \int_0^{\sqrt{5}} (2x^2 + 7) dx \quad \left \quad \text{Area} = \int_0^{\sqrt{5}} (10 - 2x^2) dx \right.$ $= 17\sqrt{5} - \frac{2}{3} \times 5\sqrt{5} - 7\sqrt{5} \quad \left \quad = 10\sqrt{5} - \frac{2}{3} \times 5\sqrt{5} \right.$ $= \frac{20}{3}\sqrt{5}$	M1 A1 B1 M1 M1 A1 (6) (6 marks)

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1(a)	$h = 0.5$	B1
	$A \approx \frac{1}{2} \times \frac{1}{2} \{2.287 + 2.834 + 2(4.470 + 6.719 + 7.291)\}$	M1
	$= \text{awrt } 10.52$	A1
		(3)
(b)(i)	$A \approx "10.52" - 4$	M1
(b)(ii)	$= 6.52$	A1ft
	$A \approx "10.52"$	B1ft
		(3)
		Total 6