1. a) $1 - 2x + 3x^2 - 4x^3$ A3

b) $1 - 4x + 12x^2 - 32x^3$ A3

$|x| < \frac{1}{2}$ OR $-\frac{1}{2} < x < \frac{1}{2}$ B1

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2. $2y\frac{dy}{dx} + 3y + 3x\frac{dy}{dx} + 2x = 0$ B3

SUBS $x=2$ $y=2$ EITHER ON ABOVE EQUATION OR INTO $\frac{-2x-3y}{2y+3x}$ M1

OBTAINS GRADIENT OF -1 A1 ft

$y - 2 = -1(x-2)$ O.E E.g $y = 4 - x$ A1

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3. $3y^2\frac{dy}{dx} = 1 - 2x$ M1

$\int 3y^2\,dy = \int 1 - 2x\,dx$ M1 separation M1 for $\int$

$y^3 = x - x^2 + C$ A1 A1

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4 a) CORRECT METHOD TO FIND CONSTANTS M1

$A = 3$, $B = 1$ A1 A1

b) $\frac{3}{2}\ln|2x+1| + \ln|x+4|$ M1 M1 M1

$\left(\frac{3}{2}\ln 9 + \ln 8\right) - \left(\frac{3}{2}\ln 1 + \ln 4\right)$ M1

$\ln 9^{\frac{3}{2}}$ OR $\ln 27$ B1

$\ln 54$ A1 c.a.o

5. $\frac{dr}{dS} \times \frac{dS}{dr}$ B1

SIGHT OF $8\pi r$ B1

$\frac{1}{8\pi r} \times 512$ B1 OR $\frac{64}{\pi r}$ M1

$\frac{8}{\pi}$ OR A.W.R.T 2.55 A1

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6. $\frac{du}{dx} = \frac{4}{x}$ OE. B1

$\int \frac{4}{xu^2} \times \frac{x}{4}\, du$ A1 A1

$\int \frac{1}{u^2}\, du$ OR $\int u^{-2}\, du$. A1

$-\frac{1}{u}(+C)$ OR $-u^{-1}(+C)$ M1

$-\frac{1}{1+4\ln x}(+C)$ A1

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7. $\pi \int_{-1}^{3} \left(\frac{6}{x+3}\right)^2 dx$ M1 M1

$-36(x+3)^{-1}$ M1

$[\ldots] - [\ \ ]$ M1

CORRECT EVALUATION WITHOUT FOLDING INTO 12π A1

8. a) $(0,15,12) - (2,10,7)$ OR $(-2,5,5)$ B1

$\underline{r} = \begin{matrix}(2,10,7)\\(0,15,12)\end{matrix} + \lambda(-2,5,5)$ o.e A1 A1

b)
$$\left.\begin{aligned} 5\lambda + 10 &= 1 - \mu \\ 5\lambda + 7 &= 3\mu - 6 \\ 2 - 2\lambda &= 2\mu + 4 \end{aligned}\right\}$$ SIGHT OF ANY TWO OF THESE B1 B1

ATTEMPTS TO SOLVE SIMULTANEOUS EQUATIONS (SET OF 2) M1

$\lambda = -2$ OR $\mu = 1$ A1

CHECKS 3 EQUATION & CONCLUDES A1

SIGHT OF $(6,0,-3)$ A1

c) ATTEMPTS DOT PRODUCT OF $(-2,5,5)$ & $(2,-1,3)$ o.e M1

$6 = \sqrt{54}\sqrt{14}\cos\theta$ o.e M1

$\theta = 77.4\ldots$ A1

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9. a) $0.9069\ldots$ AT LEAST 4 d.p B1

b) $\frac{\pi/12}{2}\left[0 + 0.6545 + 2(0.1309 + 0.4534 + "0.9069" + 0.7854)\right]$ B1 B1

A.W.R.T 0.682 A1

c) $-\frac{1}{2}x\cos 2x - \int -\frac{1}{2}\cos 2x\, dx$ o.e M1 M1

$-\frac{1}{2}x\cos 2x + \frac{1}{4}\sin 2x$ A1

ATTEMPT AT $[\ldots] - [\ldots]$ M1

$\frac{5\pi}{48}\sqrt{3} + \frac{1}{8}$ A1 A1

(ALLOW 0.692 FOR ONE MARK AS THE FINAL ANSWER)

10. a) SIGHT OF $\int y(\theta)\frac{dx}{d\theta}\,d\theta$ SCORES B1

$\int (1-\cos\theta)(1-\cos\theta)\,d\theta$ B1 $\quad \frac{dx}{d\theta} = 1-\cos\theta$ B1

ANY TWO OF THESE 3 FOR 4 MAX OF B2

IMPLIES $\theta = 0$ GIVES $(0,0)$

$\theta = 2\pi$ GIVES $(2\pi, 0)$ B1

b) $1 - 2\cos\theta + \cos^2\theta$ B1

$\cos 2\theta = 2\cos^2\theta - 1$ OR $\cos^2\theta = \frac{1}{2} + \frac{1}{2}\cos 2\theta$ B1

$\frac{3}{2} - 2\cos\theta + \frac{1}{2}\cos 2\theta$ A1

$\frac{3}{2}\theta - 2\sin\theta + \frac{1}{4}\sin 2\theta$ M1 M1

EVIDENCE OF $[\ldots] - [\ldots]$ M1

3π A1