1. a) $\frac{1}{2}(4x+1)^{-\frac{1}{2}}$ M1 (*)

$\frac{1}{2}(4x+1)^{\frac{1}{2}}$ M1

ALTERNATIVE

SUBSTITUTION LEADING TO (M1)

$\frac{1}{2}u^{\frac{1}{2}}$ OR $\frac{1}{2}\,du$ M1

↑ $u = 4x+1$ ↑ $u=(4x+1)^{\frac{1}{2}}$

1 c.a.o A1

(*) THIS MARK CAN ONLY BE SCORED IF $k(4x+1)^{\frac{1}{2}}$ IS SEEN AFTERWARDS

b) $\frac{1}{3}\sin 3x$ M1

$\frac{1}{3}\sin\pi - \frac{1}{3}\sin\frac{\pi}{2}$ M1

$-\frac{1}{3}$ A1

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2. a) CORRECT METHOD FOR ELIMINATION OR COMPARING COEFFICIENTS M1

$\frac{2}{1-x} + \frac{1}{1+3x}$ A1 A1 (MAY BE IMPLIED E.g $A=2$, $B=1$)

b) SIGHT OF $1 + x + x^2 + x^3$ ①

OR $2 + 2x + 2x^2 + 2x^3$ ②

OR $1 - 3x + 9x^2 - 27x^3$ ③

M3

BOTH THE LINES ① & ③ SEEN

OR ② & ③ SEEN (WITH MAX 1 ERROR) M1

$3 - x + 11x^2 - 25x^3$ A3 −1 eeoo

3. a) $2y\frac{dy}{dx} - 3y - 3x\frac{dy}{dx} + 8x = 0$ B3

$\frac{dy}{dx} = \frac{3y-8x}{2y-3x}$ O.E A1

b) $\frac{3y-8x}{2y-3x} = 0$ B1

$y = \frac{8}{3}x$ O.E A1

SUB $y = \frac{8}{3}x$ OR $x = \frac{3}{8}y$ INTO EQUATION OF CURVE M1

$x^2 = 9$ OR $y^2 = 64$ M1

$(3,8)$ $(-3,-8)$ A1 A1

4. $4x^2\sin x - \int 8x\sin x$ B1 B1

$-8x\cos x - \int -8\cos x\,dx$ O.E B1 B1

$4x^2\sin x + 8x\cos x - 8\sin x\,(+C)$ A1

ATTEMPTS $[\ldots\ldots]_{\frac{\pi}{2}} - [\ldots\ldots]_0$ M1

$\pi^2 - 8$ A1 c.a.o

5\. a) ATTEMPTS $(3,-8,2)-(0,-7,4)$ OR SIGHT OF $(3,-1,-2)$ B1

$\underline{r} = (0,-7,4) + \lambda(3,-1,-2)$ O.E A1 A1

[dep on correct structure $\underline{r} = \ldots$]

b) SIGHT OF $\mu = -4$ M1

$a = 8$ A1

$b = -2$ A1

c) $(3,-1,-2)\cdot(1,4,-1) = |3,-1,-2||1,4,-1|\cos\theta$

O.E E.g $\cos\theta = \dfrac{(3,-1,-2)\cdot(1,4,-1)}{\sqrt{3^2+(-1)^2+(-2)^2}\sqrt{1^2+4^2+(-1)^2}}$ M1

$1 = \sqrt{14}\sqrt{18}\cos\theta$ O.E M1

$\theta = 86.4°$ OR 1.51^c A1

6\. $\dfrac{dr}{dA} \times \dfrac{dA}{dt}$ B1

$\dfrac{dr}{dA} = \dfrac{1}{2\pi r}$ OR $\dfrac{dA}{dr} = 2\pi r$ B1

$\dfrac{dr}{dt} = \dfrac{6}{\pi r}$ O.E M1

SIGHT OF $r = 24$ B1

$\dfrac{1}{4\pi}$ OR A.W.R.T 0.08 A1

7.

$\int \frac{-5}{2y-150}\,dy = \int 1\,dx$ OR $\int \frac{1}{2y-150}\,dy = \int -\frac{1}{5}\,dx$ B1 B1

↑ INTEGRAL SIGNS

$\frac{k}{2}\ln|2y-150|$ OR $\frac{k}{2}\ln(2y-150)$ M1

$Ax + C$ M1

APPLY CONDITION M1

$y = 75 + 200e^{-\frac{2}{5}x}$ A2 −1eeoo

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8. a) 0.2620 B1

b) $\frac{\pi/18}{2}\left[0 + 0.2500 + 2(0.1632 + \text{"}0.2620\text{"})\right]$ B1 M1

A.W.R.T 0.096 A1

c) $\frac{du}{dx} = -\sin x$ B1

CHANGE LIMITS TO 1 & $\frac{\sqrt{3}}{2}$ BOTH

$\int -\cos 2x\,du$ M1

USE OF $2\cos^2 x - 1$ B1

$\int \pm(2u^2-1)$ A1

$\frac{2}{3}u^3 - u$ M1

$\frac{2}{3}\sin^3 x - \sin x$

ONE OR THE OTHER (M1)

$\left(\frac{2}{3}-1\right) - \left(\frac{2}{3}\times\left(\frac{\sqrt{3}}{2}\right)^3 - \frac{\sqrt{3}}{2}\right)$ OR A.W.R.T 0.01 M1

$\frac{1}{4}\sqrt{3} - \frac{1}{3}$ O.E A1

9. a) $\pi \int_0^{\frac{\pi}{4}} (\cos^2 t)^2 (8\sec^2 t)\, dt$ B1 B1

LIMIT BOTH B1

$\pi \int \ldots\ldots dt$ B1

SIMPLIFIES CONVINCINGLY TO THE ANSWER GIVEN A1

b) USE OF $2\cos^2 t - 1$ OR $\frac{1}{2} + \frac{1}{2}\cos 2t$ M1

$\frac{1}{2}t + \frac{1}{4}\sin 2t$ A1

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

$\pi^2 + 2\pi$ O.E A1