

1. Name: _____

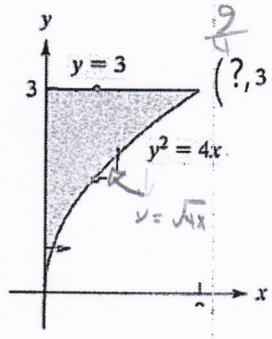
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(Show your work)

Find the area of the region bounded by the curve $y^2 = 4x$ and the lines $y = 3$ and $x = 0$ (the y-axis).

Q1.

$$\begin{aligned} y &= 3 \\ y &= \sqrt{4x} \\ 3 &= \sqrt{4x} \\ 9 &= 4x \\ x &= \frac{9}{4} \end{aligned}$$



∴ the region bounded is on $(0, \frac{9}{4})$

$$A = \int_0^{\frac{9}{4}} (3 - \sqrt{4x}) dx = F(\frac{9}{4}) - F(0)$$

$$F(x) = \int (3 - \sqrt{4x}) dx = 3x - \frac{4}{3} x^{\frac{3}{2}}$$

$$\begin{aligned} \therefore A &= F(\frac{9}{4}) - F(0) = \left[3(\frac{9}{4}) - \frac{4(\sqrt{\frac{9}{4}})^3}{3} \right] - 0 = \frac{27}{4} - 4 \frac{27}{8} \\ &= \frac{27}{4} - \frac{18}{4} = \frac{9}{4} \end{aligned}$$

Q2. Use integration by part to find

$$\int x e^{-x} dx \quad u = x \quad du = dx \quad w = -x \quad dw = -dx \quad v = -\int e^w dw = -e^w = -e^{-x}$$

$$\begin{aligned} \int x e^{-x} dx &= -\int -e^{-x} dx - x e^{-x} \\ &= -\int -e^{-x} dx - x e^{-x} \\ &= -\int e^w dw - x e^{-x} \\ &= -e^w - x e^{-x} + C \\ &= -e^{-x} - x e^{-x} + C \end{aligned}$$

Q3. $\int_0^{\pi/4} \sec^2 x dx =$

$$F(x) = \int \sec^2 x dx = \tan x$$

$$F(\frac{\pi}{4}) - F(0) = \tan(\frac{\pi}{4}) - \tan(0) = 1$$

UNDEFINED