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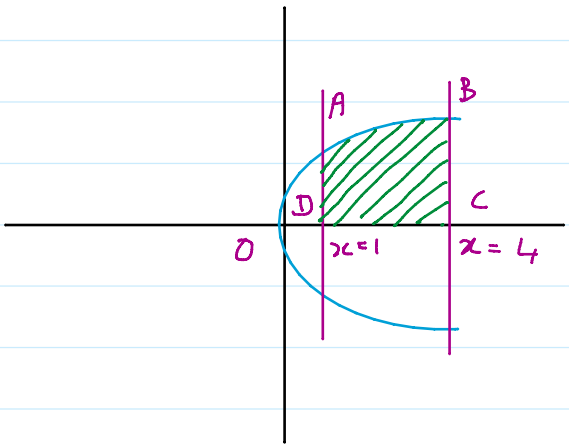
Find the area of the region bounded by the curve $y^2 = x$ and the lines $x=1$, $x=4$, and the x-axis in the first quadrant.

Solution:-



Area is of region ABCD bounded by $x=1$, $x=4$, the X-axis & the curve, above X-axis

$$y^2 = x \quad \therefore y = \pm\sqrt{x}.$$

We take $y = +\sqrt{x}$ (Quadrant I)

$$\therefore A = \int_1^4 y\,dx$$

$$\therefore A = \int_1^4 \sqrt{x}\,dx$$

$$\therefore A = \int_1^4 x^{1/2}\,dx = \left[\frac{2}{3}x^{3/2}\right]_1^4$$

$$\therefore A = \frac{2}{3}\left[4^{\frac{3}{2}} - 1^{\frac{3}{2}}\right]$$

$$\therefore A = \frac{2}{3}\left[\left(\cancel{2}\,2\right)^{\frac{3}{\cancel{2}}} - 1\right]$$

$$A = \frac{2}{3}\left[8 - 1\right] = \frac{2 \times 7}{3} = \frac{14}{3} \text{ sq. units}$$

Ans.

For your Practice:

Find the area of the region bounded by $y^2 = 9x$, $x = 2$, $x = 4$ & the x-axis in the first quadrant.