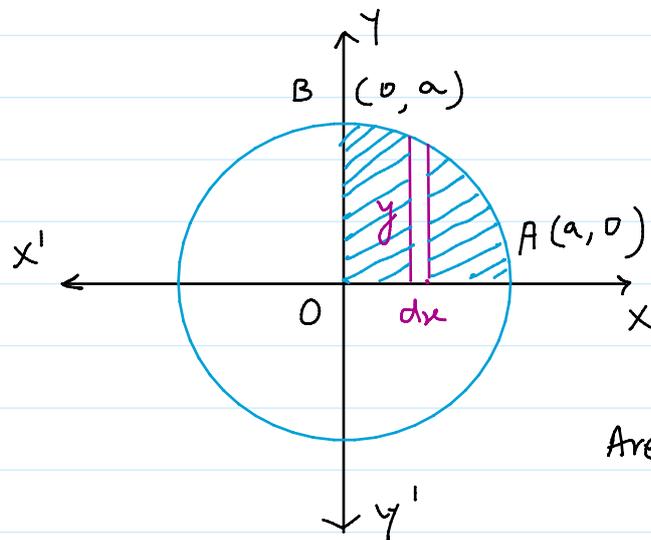# Find the area enclosed by the circle $x^2 + y^2 = a^2$.

Solution :-

Area of vertical strip
$$= y \, dx.$$

Consider the area of the region bounded OABO bounded by the curve, the x-axis, ordinates $x = 0$ and $x = a$.

Area of circle $= 4 \times$ area of OABO

$$\therefore A = 4 \times \int_0^a y \, dx$$

But $x^2 + y^2 = a^2$

$$\therefore y^2 = a^2 - x^2$$

$$\therefore y = +\sqrt{a^2 - x^2} \quad \left(\text{we take only +ve sign as region OABO is in Quad I} \right)$$

$$\therefore A = 4 \int_0^a \sqrt{a^2 - x^2} \, dx$$

$$A = 4\left[\frac{x}{2}\sqrt{a^2-x^2} \ + \frac{a^2}{2}\sin^{-1}\frac{x}{a} \right]_0^a$$

$$\therefore A = 4\left[\left(\frac{a}{2} \times 0 + \frac{a^2}{2}\sin^{-1}1 \right) - \left(0 \right) \right]$$

$$\therefore A = 4 \times \frac{a^2}{2} \times \frac{\pi}{2} \quad = \quad \pi a^2$$

$$\therefore \text{Area of circle} = \pi a^2$$

$$- \times -$$