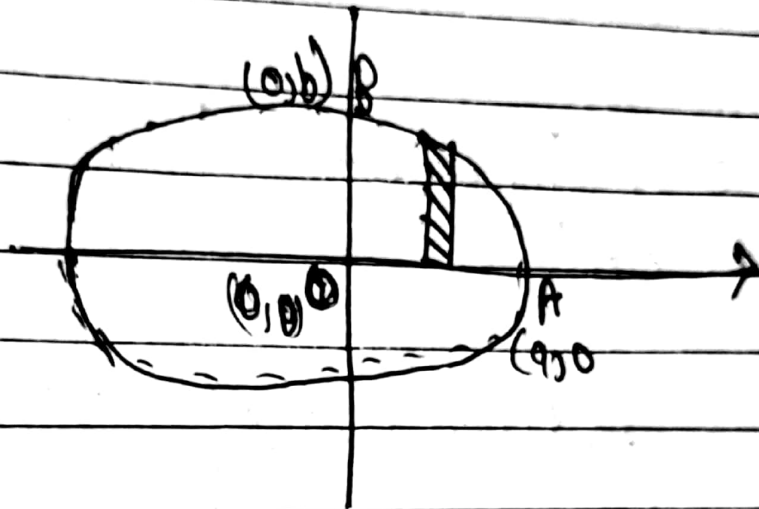


## SECTION - 3

2. The area ellipse  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$



Given  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

$$\frac{y^2}{b^2} = 1 - \frac{x^2}{a^2} = \frac{a^2 - x^2}{a^2}$$

$$y^2 = b^2 \left( \frac{a^2 - x^2}{a^2} \right)$$

$$\Rightarrow y = \frac{b}{a} \sqrt{a^2 - x^2}$$

Consider a positive co-ordinate axis  
taking strip parallel to y-axis

limit for  $x$ :  $x=0$  to  $x=a$

The area of an ellipse is

$$A = 4 \int_a^b y \, dx = 4 \int_0^a \frac{b}{a} \sqrt{a^2 - x^2} \, dx$$

$$\Rightarrow \frac{4b}{a} \int_0^a \sqrt{a^2 - x^2} \, dx$$

$$\Rightarrow \frac{4b}{a} \left[ \frac{x}{a} \sqrt{a^2 - x^2} + \frac{x^2}{a} \sin^{-1} \left( \frac{x}{a} \right) \right]_0^a$$

$$\Rightarrow \frac{4b}{a} \frac{a^2}{2} \sin^{-1}(1)$$

$$A = \frac{4b}{a} \frac{a^2}{2} \frac{\pi}{2}$$

$$A = \pi ab \text{ sq. unit}$$