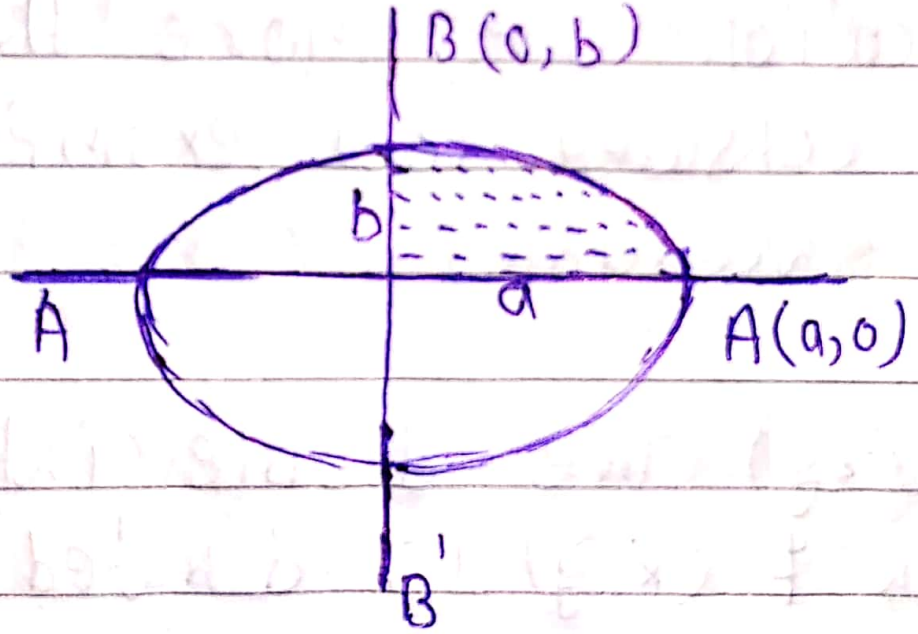
section-3

2) find the area of ellipse of $\frac{x^2}{a^2} + \frac{y^2}{b^2} =$ by double intergeration.

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



Area of one quadrant $= \iint dx\,dy$

Whole area of ellipse $= 4 \iint dx\,dy$

$$= 4\int_0^a \int b/a \sqrt{(a^2 - x^2)}$$

$$= 4\int_0^a [y]^{b/c} \sqrt{a^2 - x^2}\, dx$$

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

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

$$= \frac{4b}{a}\left[0 + \frac{a^2}{2} \times \frac{\pi}{2} - 0\right]$$

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

$$= 4b = \pi ab^2$$