$$I = \int_0^{2a} \int_{y=0}^{\sqrt{2ax-x^2}} (x^2+y^2)\, dy\, dx$$

$x=0$ to $x=2a$

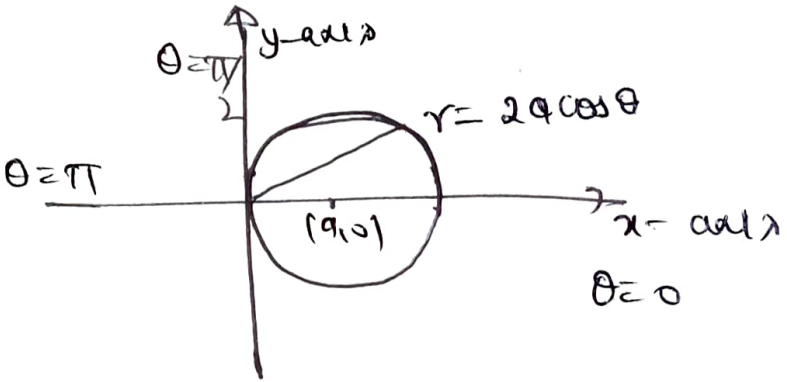
$y=0$ to $y=\sqrt{2ax-x^2}$

So $y^2 = 2ax - x^2 \Rightarrow x^2+y^2 = 2ax$

$\Rightarrow (x-a)^2 + y^2 = a^2$.

a circle of radius a & centre $(a,0)$

Now



Change in polar co-ordinate

$$I = \int_{\theta=0}^{\pi/2} \int_{r=0}^{r=2a\cos\theta} r^2 \cdot r\, dr\, d\theta$$

$$= \int_0^{\pi/2} \left\{ \int_0^{2a\cos\theta} r^3\, dr \right\} d\theta = \int_0^{\pi/2} \left(\frac{r^4}{4} \right)_0^{2a\cos\theta} d\theta$$

$$I = \frac{1}{4} \int_0^{\pi/2} (2a)^4 \cos^4\theta\, d\theta = 4a^4 \int_0^{\pi/2} \cos^4\theta$$

$$= 4a^4 \cdot \left(\frac{\Gamma 1/2 \cdot \Gamma 5/2}{2\Gamma 3} \right)$$

$$= 4a^4 \cdot \frac{(\sqrt{\pi} \cdot 3/2 \cdot 1/2 \cdot \sqrt{\pi})}{2 \cdot 2 \cdot 1}$$

$$= \frac{3\pi a^2}{4}$$