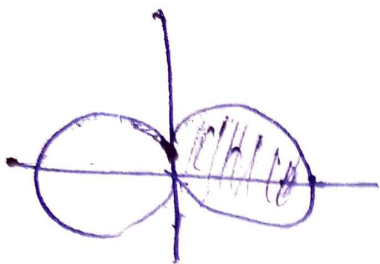


$$(x^2 + y^2)^2 = x^2 - y^2$$



Qn. - one loop

$$r^4 = r^2 (\cos^2 \theta - \sin^2 \theta)$$

$$r^2 = \cos 2\theta$$

$$-\frac{\pi}{2} \leq \theta \leq \frac{\pi}{2}$$

$$\iint \frac{dx dy}{(1 + x^2 + y^2)^2} = \int_{\theta = -\frac{\pi}{2}}^{\frac{\pi}{2}} \int_{r=0}^{\sqrt{\cos 2\theta}} \frac{r dr d\theta}{(1 + r^2)^2}$$

$$\Rightarrow \int_{\theta = -\frac{\pi}{2}}^{\frac{\pi}{2}} \left[\frac{r}{t^2} \times \frac{\partial t}{\partial r} \right]_0^{\sqrt{\cos 2\theta}} d\theta$$

$$1 + r^2 = t$$

$$\frac{\partial t}{\partial r} = 2r$$

$$\Rightarrow \frac{1}{2} \int_{\theta = -\frac{\pi}{2}}^{\frac{\pi}{2}} [t^3]_0^{\sqrt{\cos 2\theta}} d\theta$$

—) simple calculation