

Q 3. Find the slope of the normal to curve  $x = a \cos^3 \theta$ ,  $y = a \sin^3 \theta$ , at  $\theta = \frac{\pi}{4}$

Ans :  $\frac{dx}{d\theta} = -3a \cos^2 \theta \sin \theta$

$$\frac{dy}{d\theta} = 3a \sin^2 \theta \cos \theta$$

$$\therefore \frac{dy}{dx} = \frac{(dy/d\theta)}{\cancel{dx/d\theta}} = -\tan \theta.$$

$$\left. \frac{dy}{dx} \right|_{\theta = \pi/4} = -\tan \theta \Big|_{\theta = \pi/4} = -1$$

Hence slope of normal at  $\theta = \frac{\pi}{4}$  is  $= \frac{-1}{\left. \frac{dy}{dx} \right|_{\theta = \pi/4}} = \frac{-1}{-1} = 1$