LAWAL SHERIFF O

CIVIL ENGR.

16/ENG03/037

1. $x = \cos t + t\sin t$

Soln.

$$\frac{dx}{dt} = -\sin t + \sin t + t\cos t$$

$$\frac{dx}{dt} = t\cos t$$

$$\frac{dt}{dx} = \frac{1}{t\cos t}$$

$$\frac{dy}{dt} = \cos t - \cos t + t\sin t$$

$$\frac{dy}{dt} = t\sin t$$

$$\frac{dy}{dx} = \frac{dt}{dx} \cdot \frac{dy}{dt}$$

$$= t\sin t \cdot \frac{1}{t\cos t}$$

$$\frac{dy}{dx} = \tan t$$

$$\frac{d^2y}{dx^2} = \sec^2 t \cdot \frac{dt}{dx}$$

$$\frac{d^2y}{dx^2} = \sec^2 t \cdot \frac{1}{t\cos t} = \frac{\sec^2 t}{t\cos t}$$

$$\text{Radius of curvature} = \frac{\left[1 + \left[dy/dx\right]^2\right]^{3/2}}{d^2y/dx^2}$$

$$= \frac{\left[1 + \tan^2 t\right]^{3/2}}{\frac{\sec^2 t}{t\cos t}}$$

$$R = \frac{[\sec^2 t]^{3/2}}{\frac{\sec^2 t}{t\cos t}}$$

$$R = \sec^3 t \times \frac{t\cos t}{\sec^2 t}$$

$$\sec t \cdot \frac{t\cos t}{}$$

$$= \frac{1}{\cos t} \cdot t\cos t$$

$$R = t$$

2.) $h = x_1 - R\sin t$

$k = y_1 + R\cos t$

$h = \cos t + t\sin t - t\sin t$

$h = \cos t$

$k = \sin t - t\cos t + t\cos t$

$k = \sin t$

$\therefore$ Co-ordinates $(\cos t, \sin t)$