

20/03
Mechanics

Engg 281

Assignment 2

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

$$y = \sin t - t \cos t$$

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

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

$$\frac{dy}{dx} = \frac{dy}{dt} \times \frac{dt}{dx} = \frac{t \sin t}{t \cos t} = \tan t$$

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

$$\frac{d^2y}{dx^2}$$

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

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

$$R = \frac{1 + \tan^2 t}{\sec^2 t}$$

$$h = x - R \sin \theta$$
$$= x - \left(\frac{1 + \tan^2 t}{\sec^2 t} \right) \sin \theta$$

$$k = y + R \cos \theta$$
$$= y + \left(\frac{1 + \tan^2 t}{\sec^2 t} \right) \cos \theta$$