ASSIGNMENT 2

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

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

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

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

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

$dy/dt = t\sin t.$

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

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

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

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

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

$\frac{d^2y}{dx^2} = \frac{d}{dt}(\tan t) \times \frac{dt}{dx}$

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

$= \frac{1}{t} \times \frac{1}{\cos^3 t} = t^{-1}\sec^3 t$

$$\therefore \frac{d^2y}{dx^2} = t^{-1}\sec^3 t$$

$$R = \frac{\left(1 + \left(\frac{dy}{dx}\right)^2\right)^{3/2}}{\frac{d^2y}{dx^2}}$$

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

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

$$R = \frac{(\sec t)^{2\times 3/2}}{t^{-1}\sec^3 t}$$

Centre of Curvature

$x_1 = h + R\sin\theta$

$h = x_1 - R\sin\theta$

$k = Y_1 + R\cos\theta$

$\theta = \tan^{-1}\left\{\frac{dy}{dx}\right\}$

$\theta = \tan^{-1}[\tan t]$

$\theta = t$

$x_1 = \cos t + t\sin t$

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

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

$h = \underline{\underline{\cos t}}$

$K = Y_1 + R\cos\theta$

$Y_1 = \sin t - t\cos t$

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

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

$k = \sin t$

Centre of curvature $c = (\cos t, \sin t)$