SAM-OLUBUNMI CHIDIEBERE.

16/ENG01/018

CHEMICAL ENGINEERING.

ENG281

ENGINEERING MATHEMATICS.

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

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

$dy/dt = \cos t - (-t\sin t + \cos t)$.

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

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

$dy/dt = t\sin t$.

$dx/dt = -\sin t + (t\cos t + \sin t)$.

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

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

$dx/dt = t\cos t$.

$dy/dx = dy/dt \times dt/dx$.

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

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

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

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

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

$R = \frac{(\sec t)^3}{t^{-1}(\sec t)^3} = t^{+1}$ units $= t$ units.

Centre of curvature:

$x_1 = h + R\sin\theta$

$h = x_1 - R\sin\theta$

$k = y_1 + R\cos\theta$

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

$\theta = \tan^{-1}(\tan t)$

$\theta = t$

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

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

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

$h = \cos t$

$k = y_1 + R\cos\theta$

$y_1 = \sin t - t\cos t$

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

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

$k = \sin t$

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