

16/ENG05/010

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ENG 281 Assignment 2
Mechatronics Engineering

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

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

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

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

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

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

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

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

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

$$\therefore \frac{d^2y}{dx^2} = \frac{d}{dt} \left(\frac{\sin t}{\cos t} \right) \times \frac{dt}{dx}$$

$$\frac{d^2y}{dx^2} = \frac{(\cos t)(\cos t) - (\sin t)(-\sin t)}{\cos^2 t} \times \frac{1}{t \cos t}$$

From trig. Functions $\cos^2 t + \sin^2 t = 1$

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