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An Engineering

16/ENB03/OS 3

1. The parametric equation of a curve are given in equation 1 and 2

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

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

In terms of  $t$ , determine

- an expression for the radius of curvature ( $R$ );
- expressions for the coordinates ( $Ch, C$ ) of the Centre of Curvature.

Solution

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

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

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

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

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

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

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