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18/ENG05/031
MECHATRONICS

$5x^2 + y^2 = 5$ -(i)

$x^2 + y^2 = 4$ -(ii)

$y^2 = 4 - x^2$ -(iii)

solving simultaneously,

$5x^2 + (4 - x^2) = 5$

$4x^2 = 1$

$x^2 = 1/4$

$x = \sqrt{1/4} = 1/2$

$y^2 = 4 - 1/4$

$y^2 = 3.75$

$y = 1.936$

Differentiating,

$10x + 2y\, dy/dx = 0$

$dy/dx = \frac{-10x}{2y}$

$2x + 2y\, dy/dx = 0$

$dy/dx = \frac{-2x}{2y} = \frac{-x}{y}$

$dy/dx\Big|_{\substack{x=1/2 \\ y=1.936}} = \frac{-10(1/2)}{2(1.936}$

$= \frac{-5}{3.872}$

$= -1.29$

$\therefore = -x = -(1/2)$
$y \qquad 1.936$

$= -0.258$

Magnitude $= \theta_2 - \theta_1$

Finding $\theta_1$ and $\theta_2$

$\tan\theta_1 = dy/dx$

$\tan\theta_1 = -1.29$

$\theta_1 = \tan^{-1}(-1.29)$

$= -52.217°$

$\tan\theta_2 = dy/dx$

$\tan\theta_2 = -0.258$

$\theta_2 = \tan^{-1}(-0.258)$

$= -14.47°$

Magnitude $= \theta_2 - \theta_1$

$= -14.467 - (-52.217)$

$= -14.467 + 52.217$

$= 37.75°$

$f(x) := \sqrt{5 - 5x^2}$

$g(x) := \sqrt{4 - x^2}$