



# Engineering Mathematics I

Eng281

Name: Oyiibo Michael Oghenenyekhovwo

Matric No: 18/EN601/021

Department: Chemical Engineering

Solution

$$5x^2 + y^2 = 5 \quad \text{--- (i)}$$

$$x^2 + y^2 = 4 \quad \text{--- (ii)}$$

From equi(i)

$$x^2 + y^2 = 4$$

$$y^2 = 4 - x^2 \quad \text{--- (iii)}$$

Substitute, equ(iii) in equ(i)

$$5x^2 + y^2 = 5$$

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

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

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

$$4x^2 = 5 - 4$$

$$4x^2 = 1$$

$$x^2 = 1/4 \quad ; \quad x = \pm \sqrt{1/4}$$

$$x = +1/2 \text{ or } -1/2$$

From equi(iii)

$$y^2 = 4 - x^2$$

$$y^2 = 4 - (1/2)^2$$

$$y^2 = 15/4$$

$$y = \pm \sqrt{15/4} \quad ; \quad y = \pm \sqrt{15}/2 \quad \therefore (x, y) = (1/2, \sqrt{15}/2)$$

From equ(i),  $5x^2 + y^2 = 5$

$$10x + 2y \frac{dy}{dx} = 0$$

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

$$\frac{dy}{dx} = \frac{-10x}{2y} = \frac{-5x}{y}$$

Recall that  $\frac{dy}{dx} = \tan \theta$

$$\frac{-5x}{y} = \tan \theta$$

$$\frac{-5(1/2)}{\sqrt{15}/2} = \tan \theta$$

$$\frac{-5/2}{\sqrt{15}/2}$$

$$\therefore \theta = \tan^{-1} \left( \frac{-\sqrt{15}}{3} \right)$$

$$\theta_1 = -52.24^\circ //$$

from equ(ii)  $x^2 + y^2 = 4$

$$2x + 2y \frac{dy}{dx} = 0$$

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

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

Recall that  $\frac{dy}{dx} = \tan \theta$

$$\frac{-x}{y} = \tan \theta$$

$$\frac{-1/2}{\sqrt{15}/2} = \tan \theta$$

$$\frac{-\sqrt{15}}{15} = \tan \theta$$

$$15$$

$$\theta = \tan^{-1} \frac{-\sqrt{15}}{15}$$

$$\theta_2 = -14.48^\circ$$

Since magnitude =  $\theta_2 - \theta_1$

$$\therefore -14.48 - (-52.24)$$

$$= 37.76^\circ //$$