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

Differentiate using Implicit differentiation

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

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

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

$$\frac{dy}{dx} = \frac{-10(1/2)}{2(\sqrt{15}/4)}$$

$$\frac{dy}{dx} = \frac{-5}{\sqrt{15}}, \quad dy/dx = \tan\theta$$

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

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

$\theta = -52.24$

Substitute x into equation (ii)

$(\sqrt{\frac{1}{4}})^2 + y^2 = 4$

$1/4 + y^2 = 4$

$y^2 = 4 - 1/4$

$y^2 = 16 - 1/4 \Rightarrow y = \frac{\sqrt{15}}{4} = 1.9365$

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

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

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

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

$$\frac{dy}{dx} = \frac{1}{\sqrt{15}}$$

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

$\theta_2 = \tan^{-1}(-1/\sqrt{15}) = -14.48$

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$x^2 + y^2 = 4$ ..... (i)

$5x^2 + y^2 = 4$ ..... (ii)

Solution

$y^2 = 5(1 - x^2)$ ..... (iii)

Substitute for y^2 in equation (i)

$x^2 + 5(1-x)^2 = 4$

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

$x^2 - 5x^2 = -1$

$-4x^2 = -1$

$x^2 = \frac{-1}{-4}$

$x^2 = 1/4$

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

Substitute $x = 1/2$ into equation (i)

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

$1/4 + y^2 = 4$

$y^2 = 4 - 1/4$

$y^2 = 15/4$

$y = \sqrt{15/4}$

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