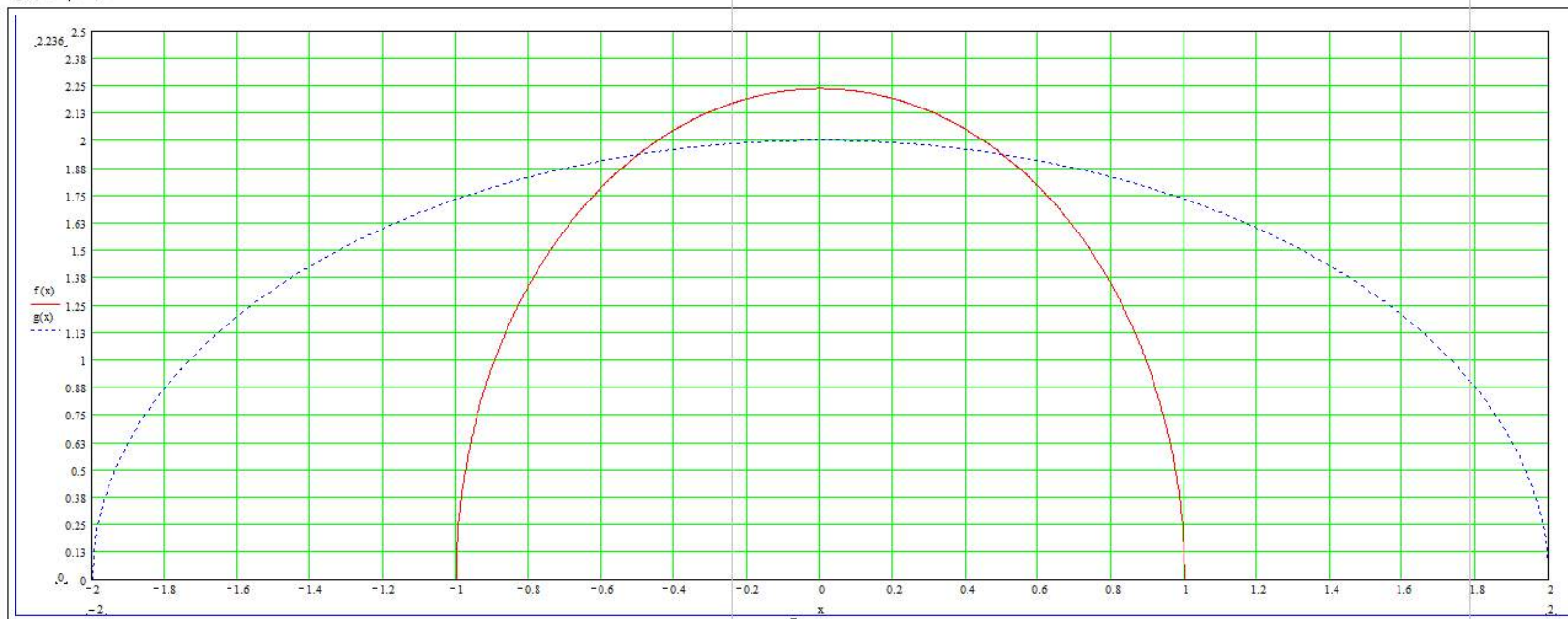


$$f(x) := \sqrt{5 - 5x^2}$$

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



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ENGINEERING MATHS

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

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

Solve simultaneously using substitution

$$y^2 = 5 - 5x^2$$

Substitute in eqn (ii)

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

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

$$-4x^2 = -1$$

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

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

$$\cancel{x = \frac{1}{2}} \quad x = \frac{1}{2}$$

Substitute  $x$  in eqn (ii)

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

$$\frac{1}{4} + y^2 = 4; \quad y^2 = 4 - \frac{1}{4}$$

$$y^2 = \frac{16-1}{4}; \quad y^2 = \frac{15}{4} \quad y = \sqrt{\frac{15}{4}} \text{ or } y = 1.9365$$

Differentiate eqn (i) & (ii) implicitly

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

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

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

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

$$\frac{dy}{dx} = \frac{-5}{\sqrt{15}}$$

$$\theta = \tan^{-1}\left(\frac{-5}{\sqrt{15}}\right); \quad \theta = -52.238^\circ$$

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

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

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

$$\frac{dy}{dx} = \frac{-1}{\sqrt{15}}; \quad \theta = \tan^{-1}\left(\frac{-1}{\sqrt{15}}\right)$$

$$\cancel{\frac{dy}{dx} = \tan^{-1} \theta} \quad \theta = -14.48^\circ$$