

$$(1+2)^2 + (y+3)^2 = 25 \quad | -9$$

$$(y+3)^2 = 16$$

$$\begin{array}{r} y+3 = \pm 4 \\ -3 \quad -3 \end{array}$$

$$y = -3 \pm 4$$

$$y = -3 + 4 = 1$$

$$y = -3 - 4 = -7$$

$$\frac{dy}{dx} = \text{UND}$$

set denominator = 0

$$4x + 8y = 0$$

$$\frac{4x}{4} = -\frac{8y}{4}$$

$$x = -2y$$

$$x = -2(1)$$

$$x = -2$$

Determine the slope of the function at the given value of x
 G) $(x+2)^2 + (y+3)^2 = 25$

$$2(x+2) + 2(y+3) \cdot \frac{dy}{dx} = 0$$

$$\frac{2(y+3) \frac{dy}{dx}}{2(y+3)} = \frac{-2(x+2)}{2(y+3)}$$

$$(1,1) (1,-7) \frac{dy}{dx} = -\frac{(x+2)}{(y+3)}$$

$$\left. \frac{dy}{dx} \right|_{(1,1)} = -\frac{3}{4}$$

$$\left. \frac{dy}{dx} \right|_{(1,-7)} = -\frac{3}{4} = \frac{3}{4}$$

Find where the slope of the curve is undefined

$$H) x^2 + 4xy + 4y^2 - 3x = 6$$

$$2x + 4x\left(\frac{dy}{dx}\right) + y(4) + 8y\frac{dy}{dx} - 3 = 0 \rightarrow$$

$$4x\frac{dy}{dx} + 8y\frac{dy}{dx} = -2x - 4y + 3$$

$$\frac{dy}{dx}(4x + 8y) = -2x - 4y + 3$$

$$\frac{dy}{dx} = \frac{-2x - 4y + 3}{4x + 8y}$$

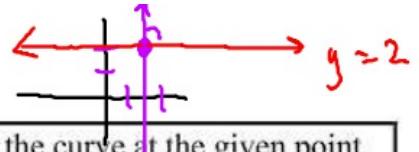
$$(-2y)^2 + 4(-2y)y + 4y^2 - 3(-2) = 6$$

$$4y^2 - 8y^2 + 4y^2 + 6y = 6$$

$$6y = 6$$

$$y = 1$$

$$y = 2 + o(x - \sqrt{3})$$



Tangent

$$y = 2$$

Normal

$$x = \sqrt{3}$$

Find the lines that are tangent and normal to the curve at the given point

$$I) x^2 - \sqrt{3}xy + 2y^2 = 5$$

$$x^2 - (\sqrt{3}y)x + 2y^2 = 5$$

$$2x - \left(\sqrt{3}y + x\frac{dy}{dx} \right) + 4y\frac{dy}{dx} = 0$$

$$4y\frac{dy}{dx} - x\sqrt{3}\frac{dy}{dx} = -2x + y\sqrt{3}$$

$$\frac{dy}{dx}(4y - x\sqrt{3}) = -2x + y\sqrt{3}$$

$$\frac{dy}{dx} = \frac{-2x + y\sqrt{3}}{4y - x\sqrt{3}} \quad \left. \frac{dy}{dx} \right|_{(\sqrt{3}, 2)} = \frac{-2(\sqrt{3}) + 2\sqrt{3}}{8 - (\sqrt{3})(\sqrt{3})} = \frac{0}{5} = 0$$

Tangent line (horizontal)

Find the lines that are tangent and normal to the curve at the given point

$$J) x\sin(2y) = y\cos(2x) \quad \left(\frac{\pi}{4}, \frac{\pi}{2} \right)$$

$$x\cos(2y) \cdot 2\frac{dy}{dx} + \sin(2y) = y(-\sin(2x)) \cdot 2 + \cos(2x)\frac{dy}{dx}$$

$$\frac{\pi}{4}\cos\left(\frac{\pi}{2}\right) \cdot 2\frac{dy}{dx} + \sin\left(\frac{\pi}{2}\right) = \frac{\pi}{2} \left(-\sin\left(\frac{\pi}{4}\right) \cdot 2 + \cos\left(\frac{\pi}{4}\right)\frac{dy}{dx} \right)$$

$$-\frac{\pi}{4} \cdot 2\frac{dy}{dx}$$

$$\frac{-\frac{\pi}{2}\frac{dy}{dx}}{-\frac{\pi}{2}} = \frac{-\pi}{(-\frac{\pi}{2})}$$

$$\left(\frac{\pi}{4}, \frac{\pi}{2} \right) \quad m = 2$$

$$y = \frac{\pi}{2} + 2(x - \frac{\pi}{4}) \text{ Tangent}$$

$$y = \frac{\pi}{2} - \frac{1}{2}(x - \frac{\pi}{4}) \text{ Normal}$$

$$\boxed{\frac{dy}{dx} = 2}$$