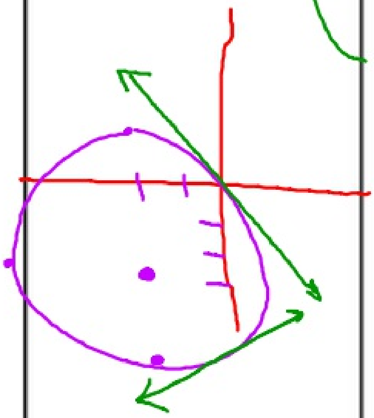
$$4 + (y+3)^2 = 25$$
$$\underline{-4 \qquad\qquad -4}$$
$$(y+3)^2 = 21$$
$$y+3 = \pm\sqrt{21}$$
$$y = -3 \pm \sqrt{21}$$

Determine the slope of the function at the given value of x $\quad x = 0$

G) $(x+2)^2 + (y+3)^2 = 25$



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

$$2(0+2) + 2(\_ + 3)\frac{dy}{dx} = 0$$

$$4 + 2(-3+\sqrt{21}+3)\frac{dy}{dx} = 0$$

$$4 + 2\sqrt{21}\frac{dy}{dx} = 0$$
$$\underline{-4 \qquad\qquad -4}$$
$$2\sqrt{21}\frac{dy}{dx} = -4$$

$$\frac{dy}{dx} = \frac{-4}{2\sqrt{21}}$$

$$4 + 2(-3-\sqrt{21}+3)\frac{dy}{dx} = 0$$
$$4 - 2\sqrt{21}\frac{dy}{dx} = 0$$
$$\frac{dy}{dx} = \frac{-4}{-2\sqrt{21}} = \frac{2}{\sqrt{21}}$$

Find where the slope of the curve is undefined

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

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

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

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

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

Set Denominator = 0

$$4x + 8y = 0$$
$$\frac{4x}{4} = \frac{-8y}{4}$$
$$x = -2y$$

$$x = -2$$

$$x^2 + 4xy + 4y^2 - 3x = 6$$
$$(-2y)^2 + 4(-2y)y + 4y^2 - 3(-2y) = 6$$
$$4y^2 - 8y^2 + 4y^2 + 6y = 6$$
$$y = 1$$

$$\boxed{(-2, 1)}$$

$y = 2 + 0(x - \sqrt{3})$

$y = 2$

Perpendicular

$x = \sqrt{3}$

	Find the lines that are tangent and normal to the curve at the given point $I)\ x^2 - \sqrt{3}xy + 2y^2 = 5 \qquad (\sqrt{3}, 2)$ $2x - \left(\sqrt{3}x\frac{dy}{dx} + y(\sqrt{3})\right) + 4y\frac{dy}{dx} = 0$ $2\sqrt{3} - \left(\sqrt{3}\sqrt{3}\frac{dy}{dx} + 2\sqrt{3}\right) + 4(2)\frac{dy}{dx} = 0$ $2\sqrt{3} - \frac{3dy}{dx} - 2\sqrt{3} + 8\frac{dy}{dx} = 0$ $5\frac{dy}{dx} = 0$ $\frac{dy}{dx} = 0$
	Find the lines that are tangent and normal to the curve at the given point $J)\ x\sin(2y) = y\cos(2x) \qquad \left(\frac{\pi}{4}, \frac{\pi}{2}\right)$

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

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

$\frac{\pi}{4}(-1)\,2\frac{dy}{dx} = -\frac{\pi}{2}(1)(2)$

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

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

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

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

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

Determine the 2nd derivative of the function defined implicitly

$K)\ 2x^3 - 3y^2 = 8$

$$6x^2 - 6y\frac{dy}{dx} = 0$$

$$\frac{6x^2}{6y} = \frac{6y\frac{dy}{dx}}{6y}$$

$$\boxed{\frac{x^2}{y} = \frac{dy}{dx}}$$

$$\frac{d^2y}{dx^2} = \frac{y(2x) - x^2\left(\frac{dy}{dx}\right)}{y^2}$$

$$\frac{d^2y}{dx^2} = \frac{(y)\,2xy - x^2\left(\frac{x^2}{\cancel{y}}\right)\cancel{(y)}}{y^2(y)}$$

$$\boxed{\frac{d^2y}{dx^2} = \frac{2xy^2 - x^4}{y^3}}$$

$L)\ x^{\frac{1}{3}} - y^{\frac{1}{3}} = 1$

$$\frac{1}{3}x^{-2/3} - \frac{1}{3}y^{-2/3}\frac{dy}{dx} = 0$$

$$\frac{1}{3}x^{-2/3} = \frac{1}{3}y^{-2/3}\frac{dy}{dx}$$

$$\frac{\frac{1}{3}x^{-2/3}}{\frac{1}{3}y^{-2/3}} = \frac{dy}{dx}$$

$$\boxed{\frac{y^{2/3}}{x^{2/3}} = \frac{dy}{dx}}$$

$$\frac{d^2y}{dx^2} = \frac{x^{2/3}\left(\frac{2}{3}y^{-1/3}\right)\frac{dy}{dx} - y^{2/3}\left(\frac{2}{3}x^{-\frac{1}{3}}\right)}{\left(x^{2/3}\right)^2}$$

$$\frac{d^2y}{dx^2} = \frac{\cancel{x^{2/3}}}{1}\cdot\frac{2y^{-1/3}}{3}\left(\frac{y^{2/3}}{\cancel{x^{2/3}}}\right) - y^{\frac{2}{3}}\cdot\frac{2x^{-1/3}}{3}$$

$$\frac{\cancel{(3x^{1/3})}\frac{2y^{1/3}}{\cancel{3}} - \frac{2y^{2/3}}{\cancel{3x^{1/3}}}\cancel{(3x^{1/3})}}{x^{4/3}(3x^{1/3})}$$

$$\boxed{\frac{2x^{1/3}y^{1/3} - 2y^{2/3}}{3x^{5/3}}}$$

$$\boxed{\frac{2\sqrt[3]{xy} - 2\sqrt[3]{y^2}}{3\sqrt[3]{x^5}}}$$