$9 + (y+3)^2 = 25$ $(y+3)^2 = 16$ $y+3 = \pm 4$ $-3 \quad -3$ $y = 4-3 = 1$ $y = -4-3 = -7$	Determine the slope of the function at the given value of x $\quad x = 1$ $G)\ (x+2)^2 + (y+3)^2 = 25$ $\boxed{2(x+2) + 2(y+3)\cdot\frac{dy}{dx} = 0}$ $2(y+3)\frac{dy}{dx} = -2(x+2)$ $\frac{dy}{dx} = \frac{-2(x+2)}{2(y+3)} = \boxed{-\frac{(x+2)}{(y+3)}}$ $\left.\frac{dy}{dx}\right\|_{(1,1)} = \frac{-(x+2)}{y+3} = -\frac{3}{4}$ $\left.\frac{dy}{dx}\right\|_{(1,-7)} = \frac{-(x+2)}{y+3} = \frac{-3}{-4} = \frac{3}{4}$ slope undefined $y = -3$ $(\ ,-3) \ (\ ,-3)$ Find where the slope of the curve is undefined denominator of slope = 0 $H)\ x^2 + 4xy + 4y^2 - 3x = 6$ $2x + \left[4x\frac{dy}{dx} + y(4)\right] + 8y\frac{dy}{dx} - 3 = 0$ $4x\frac{dy}{dx} + 8y\frac{dy}{dx} = -2x - 4y + 3$ $\frac{\frac{dy}{dx}(4x+8y)}{(4x+8y} = \frac{-2x-4y+3}{4x+8y}$ $\boxed{\frac{dy}{dx} = \frac{-2x-4y+3}{4x+8y}}$ slope und? $4x + 8y = 0$ $\frac{8y}{8} = \frac{-4x}{8}$ $\boxed{y = -\frac{1}{2}x}$ $\quad \boxed{x = -2y}$ slope defined $y \neq -\frac{1}{2}x$

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

$I)\ x^2-\sqrt{3}xy+2y^2=5 \qquad \left(\sqrt{3},2\right)$

$\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\ \ x\ \ y$

$2x-\left[\sqrt{3}\,x\frac{dy}{dx}+y\sqrt{3}\right]+4y\frac{dy}{dx}=0$

$2\sqrt{3}-\left[\sqrt{3}\cdot\sqrt{3}\frac{dy}{dx}+2\sqrt{3}\right]+4(2)\frac{dy}{dx}=0$

$-3\frac{dy}{dx}+8\frac{dy}{dx}=0$

$5\frac{dy}{dx}=0$

$\frac{dy}{dx}=0$

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

$\boxed{y=2}$ Tangent

$\boxed{x=\sqrt{3}}$ Normal

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, y)

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

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

$0 \qquad 0$

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

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

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

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

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

	Determine the 2nd derivative of the function defined implicitly
	$K)\ 2x^3 - 3y^2 = 8$ $6x^2 - 6y\frac{dy}{dx} = 0$ $-6y\frac{dy}{dx} = -6x^2$ $\frac{dy}{dx} = \frac{-6x^2}{-6y}$ $\boxed{\frac{dy}{dx} = \frac{x^2}{+y}}$ $\frac{d^2y}{dx^2} = \frac{y(2x) - x^2\left(\frac{dy}{dx}\right)}{y^2}$ $\frac{\cancel{(y)}2xy - x^2\left(\frac{x^2}{\cancel{y}}\right)\cancel{(y)}}{(y)y^2}$ $\boxed{= \frac{2xy^2 - x^4}{y^3}}$
$x^{1/3} - y^{1/3} = 1 \leftarrow$ $-y^{1/3} = 1 - x^{1/3}$ $y^{1/3} = -1 + x^{1/3}$ $y = (-1 + x^{1/3})^3$	$L)\ x^{\frac{1}{3}} - y^{\frac{1}{3}} = 1$ $\frac{1}{3}x^{-2/3} - \frac{1}{3}y^{-2/3}\frac{dy}{dx} = 0$ $-\frac{1}{3}y^{-2/3}\frac{dy}{dx} = -\frac{1}{3}x^{-2/3}$ $\frac{dy}{dx} = \frac{-\frac{1}{3}x^{-2/3}}{-\frac{1}{3}y^{-2/3}}$ $\boxed{\frac{dy}{dx} = \frac{y^{2/3}}{x^{2/3}}}$ $\frac{d^2y}{dx^2} = \frac{x^{2/3}\,\frac{2}{3}y^{-1/3}\left(\frac{dy}{dx}\right) - y^{\frac{2}{3}}\cdot\frac{2}{3}x^{-1/3}}{x^{4/3}}$ $= \frac{\frac{2\cancel{x^{2/3}}}{3y^{+1/3}}\left(\frac{y^{2/3}}{\cancel{x^{2/3}}}\right) - \frac{2y^{2/3}}{3x^{1/3}}}{x^{4/3}}$ $\frac{(\cancel{3}x^{1/3})}{1}\ \frac{\frac{2y^{\frac{1}{3}}}{\cancel{3}} - \frac{2y^{2/3}}{\cancel{3x^{1/3}}}\cancel{(3x^{1/3})}}{x^{4/3}(3x^{1/3})}$ $\boxed{\frac{2x^{1/3}y^{1/3} - 2y^{2/3}}{3x^{5/3}}}$