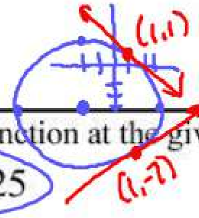


Determine the slope of the function at the given value of x $x=1$

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

$(1+2)^2+(y+3)^2=25$
$-9 \qquad -9$
$\sqrt{(y+3)^2}=\sqrt{16}$

$y+3=\pm 4$
$-3 \quad -3$
$y=-3\pm 4$

$y=-3+4=1$
$y=-3-4=-7$

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

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

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

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

Find where the slope of the curve is undefined

H) $x^2+4xy+4y^2-3x=6$ $\boxed{(-2,1)}$

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

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

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

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

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

set denominator $=0$

$4x+8y=0$

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

$x=-2y$

$y=-\frac{1}{2x}$

$x=-2(1)$

$x=-2$

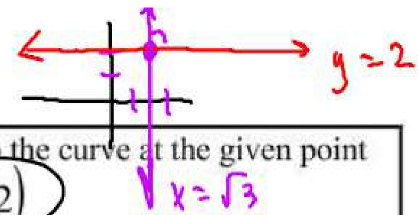
$(-2y)^2+4(-2y)y+4y^2-3(-2y)=6$

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

$6y=6$

$y=1$

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



Tangent

$\boxed{y = 2}$

Normal

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

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

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

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

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

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

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

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

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

tangent line → Horizontal

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

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

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

$$\frac{\pi}{4}\cos\left(\frac{2\pi}{2}\right)\cdot 2\frac{dy}{dx} + \sin\left(\frac{2\pi}{2}\right) = \frac{\pi}{2}\left(-\overset{1}{\sin\left(\frac{2\pi}{4}\right)}\cdot 2 + \underbrace{\cos\left(\frac{2\pi}{4}\right)}_{0}\frac{dy}{dx}\right)$$

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

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

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

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

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

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