$7y - 14 = -8x + 8$

$7y + 8x - 14 - 8 = 0$

$7y + 8x - 22 = 0$ is the equation of tangent

b) Equation of normal.

$y - y_1 = \frac{-1}{m}(x - x_1)$

$y - 2 = \frac{-1}{-8/7}(x - 1)$

$y - 2 = \frac{7}{8}(x - 1)$

$8(y - 2) = 7(x - 1)$

$8y - 16 = 7x - 7$

$8y - 7x - 16 + 7 = 0$

$8y - 7x - 9 = 0$ is the equation of normal

3) $x^2 + y^2 + 3xy - 11 = 0 \quad (x = 1, y = 2)$

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

$x^2 + y^2 + 3xy - 11 = 0$

$\frac{dy}{dx}$

$2x + 2y\frac{dy}{dx} + 3\left(x \cdot \frac{dy}{dx} + y \cdot 1\right) = 0$

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

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

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

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

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

$$m = \left.\frac{dy}{dx}\right|_{x=1, y=2} = \frac{-2(1) - 3(2)}{2(2) + 3(1)} = \frac{-2 - 6}{4 + 3} = \frac{-8}{7}$$

ii) Equation of tangent

$$y - y_1 = m(x - x_1)$$

$$y - 2 = \frac{-8}{7}(x - 1)$$

$$7(y - 2) = -8(x - 1)$$

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Math 104 Assignment.

1) Examine whether or not these pair of lines are perpendicular to each other.

(1) $y-3x-2=0$ and $3y+x+9=0$ (2)

(2) $3y-4=2x+3$ and $y-5=x+6$ §

(3) Find the equations of the tangent and normal to the curve x square + y square $+3xy-11=0$ at the point $x=1, y=2$

Solutions

1) $y-3x-2=0$

$3y+x+9=0$

For the lines to be perpendicular then $M_1 M_2 = -1$

$y-3x-2=0$

making y the subject of the formula.

$y = 3x+2$

$y = 3x+2$

By comparing with $y=mx+c$

$M_1 = 3$.

$3y+x+9=0$

making y the subject of the formula.

$3y = -x-9$

$y = \frac{-x}{3} - \frac{9}{3}$

$y = \frac{-1x-3}{3}$

$y = mx+c$; $m_2 = -1/3$

$M_1 M_2 = -1$ for perpendicularity

$3x - 1/3 = -1$. since $M_1 M_2 = -1$ then the lines $y=3x-2$ and $3y+x+9=0$ are perpendicular