Obi Obimtochukwu Princewill
19/MHS01/270

Solutions

1 $y - 3x - 2 = 0$

$3y + x + 9 = 0$

for the lines 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 comparison with $y = mx + c$

$m_1 = 3$

$3y + x + 9 = 0$

making y the subject of formula

~~making y~~ $3y = -x - 9$

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

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

By comparison with $y = mx + c$

$m_2 = -1/3$

$M_1 M_2 = -1$ is for perpendicularity
$3x - \frac{1}{3} = -1$. Since $M_1 M_2 = -1$, therefore,
The lines $y - 3x - 2 = 0$ and $y = 3y + x + 0$
$= 0$ Are perpendicular.

2 $3y - 4 = 2x + 3$ — ①
$y - 5 = x + 6$ --- ②

Making y the subject of formula in 1

$3y = 2x + 3 + 4$

$3y = 2x + 7$

$y = \frac{2x}{3} + \frac{7}{3}$

By comparing with $y = mx + c$

$m_1 = \frac{2}{3}$

Making y the subject of formula in 2

$y - 5 = x + 6$

$y = x + 6 + 5$

$y = x + 11$

By comparing with $y = mx + c$

$m_2 = \underline{1}$

But for the lines to be perpendicular

$m_1 m_2 = -1$

$m_1 m_2 = 2/3 \times 1 = 2/3$

$m_1 m_2 \neq -1$

Hence the lines $3y-4 = 2x+3$ and $y-5 = x+6$ are NOT perpendicular.

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

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

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

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

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

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

$dy/dx\,(2y+3x) = -2x-3y$

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

$m = \frac{dy}{dx}\Big|_{x=1, y=2}$

$\therefore = \frac{-2(1)-3(2)}{2(2)+3(1)} = \frac{-2-6}{4+3} = \frac{-8}{7}$

a Equation of tangent

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

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

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

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

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

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

b Equation of normal

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

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

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

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

$8y - 16 = 7x - 7$

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

equation of normal $\Rightarrow 8y - 7x - 9 = 0$