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Assignment:

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

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

Comparing the equations to equation of line

Equation of line $= y = mx + c$.

Equation 1; $y - 3x - 2 = 0$.

$y = 3x + 2$.

$m_1 = 3$.

Equation 2; $3y + x + 9 = 0$.

$3y = -x - 9$

$y = -x/3 - 3$

$m_2 = -1/3$

Recall that perpendicular lines, $m_1 m_2 = -1$.

$3 \times -1/3 = -1$

$\therefore$, $y - 3x - 2 = 0$ and $3y + x + 9 = 0$ are perpendicular to each other.

2) $3y - 4 = 2x + 3$ and $y - 5 = x + 6$

Comparing the equations to equation of line.

Equation of line; $y = mx + c$.

Equation 1, $3y - 4 = 2x + 3$

$3y = 2x + 3 + 4$

$3y = 2x + 7$

$y = 2/3x + 7/3$

$m_1 = 2/3$.

Equation 2, $y - 5 = x + 6$

$y = x + 6 + 5$

$y = x + 11$.

$m_2 = 1$

Perpendicular line, $m_1 m_2 = -1$

$2/3 \times 1 = 2/3$; $2/3 \neq -1$.

$\therefore$ $3y - 4 = 2x + 3$ and $y - 5 = x + 6$ are not perpendicular to each other.

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

Solution

$m = dy/dx = 2x+2y\,dy/dx+3[x\,dy/dx+y(1)]=0$

$= 2x+2y\,dy/dx+3x\,dy/dx+3y=0$

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

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

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

$(2y+3x)$

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

Equation of the tangent; $y-y_1 = m(x-x_1)$

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

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

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

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

Equation of normal; $y-y_1 = -1/m(x-x_1)$

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

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

$8y-16 = 7x-7$

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

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