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Course MATH 104.

1. If the 2 eq are perpendicular, $m_1 \times m_2 = -1$
$y - 3x - 2 = 0$ and $3y + x + 9 = 0$
Recall, eq of a straight line, $y = mx + c$
where m is gradient, m
For eq 1 $y = mx + c$ —(I)
$y = 3x + 2$ —(II)
∴ by comparing eq (i) & (ii)
$m_1 = 3$
For eq 2 $y = m_2 x + c$ —(III)
$3y = -x - 9$
$y = \frac{-3x}{3} - \frac{9}{3}$ —(IV)
$m_2 = -1/3$ (By comparing eq (III) & (IV)
For them to be perpendicular, $m_1 \times m_2 = -1$
$3 \times \frac{-1}{3} = -1$
Therefore, they are perpendicular

2 $3y - 4 = 2x + 3$ and $y - 5 = x + 6$
Eq 1
$3y = 2x + 7$
$y = \frac{2x}{3} + \frac{7}{3}$
Compare with $y = mx + c$
∴ $m_1 = 2/3$

Eq 2
$y - 5 = x + 6$

$y = x + 11$

Compare with $y = m_2 x + c$

$m_2 = 1$

For the lines to be perpendicular, $m_1 \times m_2 = -1$

$\frac{2}{3} \times 1 \neq -1$

Therefore the lines are not perpendicular.

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

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

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

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

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

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

$dy/dx = -8/7$

For equation of tangent, $y - y_1 = m(x - x_1)$

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

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

$7y + 8x - 22 = 0$

For eq of normal, $y - y_1 = \frac{-1}{m}(x - x_1)$

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

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

$8y - 16 = 7x - 7$

$8y - 7x - 9 = 0$ //