19/MHS01/023

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19/MHS01/023
MEDICINE AND SURGERY
MAY 10th: ASSIGNMENT

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

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

$y - 3x - 2 = 0$

$y = 3x + 2$

$y = mx + c$

gradient, $m_1 = 3$

$3y + x + 9 = 0$

$3y = -x - 9$

$y = -x - 9/3$

$y = mx + c$

gradient, $m_2 = -1/3$

$m_1 = 3$, $m_2 = -1/3$ ... since $m_1 = -1/m_2$, then they are perpendicular.

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

$3y - 4 = 2x + 3$

$3y = 2x + 3 + 4$

$3y = 2x + 7$

$y = 2x + 7/3$

$y = mx + c$

gradient, $m_1 = 2/3$

$y - 5 = x + 6$

$y = x + 6 + 5$

$y = x + 11$

$y = mx + c$

gradient, $m_2 = 1$ ... $m_1 = 2/3$ and $m_2 = 1$, since $m_1 \neq m_2$, they aren't perpendicular.

19/MMS011023
MAT 104

3. $x^2 + y^2 + 3y - 11 = 0$ at point $(1,2)$

$2x + 2y\,dy/dx + 3(x + dy/dx \times y \times 1) - 0 = 0$

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

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

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

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

when $x = 1$ and $y = 2$

$m = -(2(2) + 3(1)) / 2(2) + 3(1)$

$= -(2+6)/4+3 = -8/7$

$m = -8/7$

Equation of the tangent to the curve

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

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

$y - 2 = -8x/7 + 8/7$

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

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

$8x + 7y - 22 = 0$

Equation of the normal to a curve

$y - y_1 = -1/m(x - x_1)$

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

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

$y - 2 = 7x/8 - 7/8$

$8y - 16 = 7x - 7$

$8y = 7x - 7 + 16$

$7x - 8y + 9 = 0$