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DEPT: MEDICINE AND SURGERY

MATH 104 ASSIGNMENT

① If $y - 3x - 2 = 0$ and $3y + x + 9 = 0$ are perpendicular or not

ⓐ $y - 3x - 2 = 0$

$\Rightarrow y = mx + c$

$\therefore y = 3x + 2$

$\therefore m_1 = 3$

ⓑ $3y + x + 9 = 0$

$y = mx + c$

$\therefore 3y = -x - 9$

$\therefore m_2 = -1/3$

\rightarrow Formula for perpendicular lines: $m_1 m_2 = -1$

$\therefore m_1 = 3$

$m_2 = -1/3$

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

\therefore The lines are perpendicular to each

\therefore The lines $(y - 3x - 2 = 0)$ and $(3y + x + 9 = 0)$ are perpendicular

② To find if $3y - 4 = 2x + 3$ and $y - 5 = x + 6$ are perpendicular to each other

ⓐ $3y - 4 = 2x + 3$

$y = mx + c$

$3y = 2x + 3 + 4$

$3y = 2x + 7$

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

$\therefore m_1 = 2/3$

ⓑ $y - 5 = x + 6$

$y = mx + c$

$y = x + 6 + 5$

$y = x + 11$

$\therefore m_2 = 1$

→ Formula for Perpendicular lines

$$m_1 m_2 = -1$$

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

$$m_2 = 1$$

$$\therefore \frac{2}{3} \times 1 = \frac{2}{3}$$

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

\(\therefore\) The lines $(3y - 4 = 2x + 3)$ and $(y - 5 = x + 6)$ are not perpendicular

③ To find the equation of tangent and normal to the Curve $x^2 + y^2 + 3xy - 11 = 0$ at the point $x=1, y=2$

Soln

$$x^2 + y^2 + 3xy - 11 = 0 \quad 2x + 2y \frac{dy}{dx} + 3(x + \frac{dy}{dx} + y) = 0$$

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

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

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

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

Where $x=1$ and $y=2$

$$m = -\left(\frac{2(1) + 3(2)}{2(2) + 3(1)}\right)$$

$$m = -\left(\frac{2+6}{4+3}\right) = -\frac{8}{7}$$

② Eqn of tangent

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

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

$$y - 2 = -\frac{8}{7}x + \frac{8}{7}$$

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

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

$$7y + 8x = 22$$

$$7y + 8x - 22 = 0$$

⑩ Eqn of normal

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

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

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

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

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

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

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