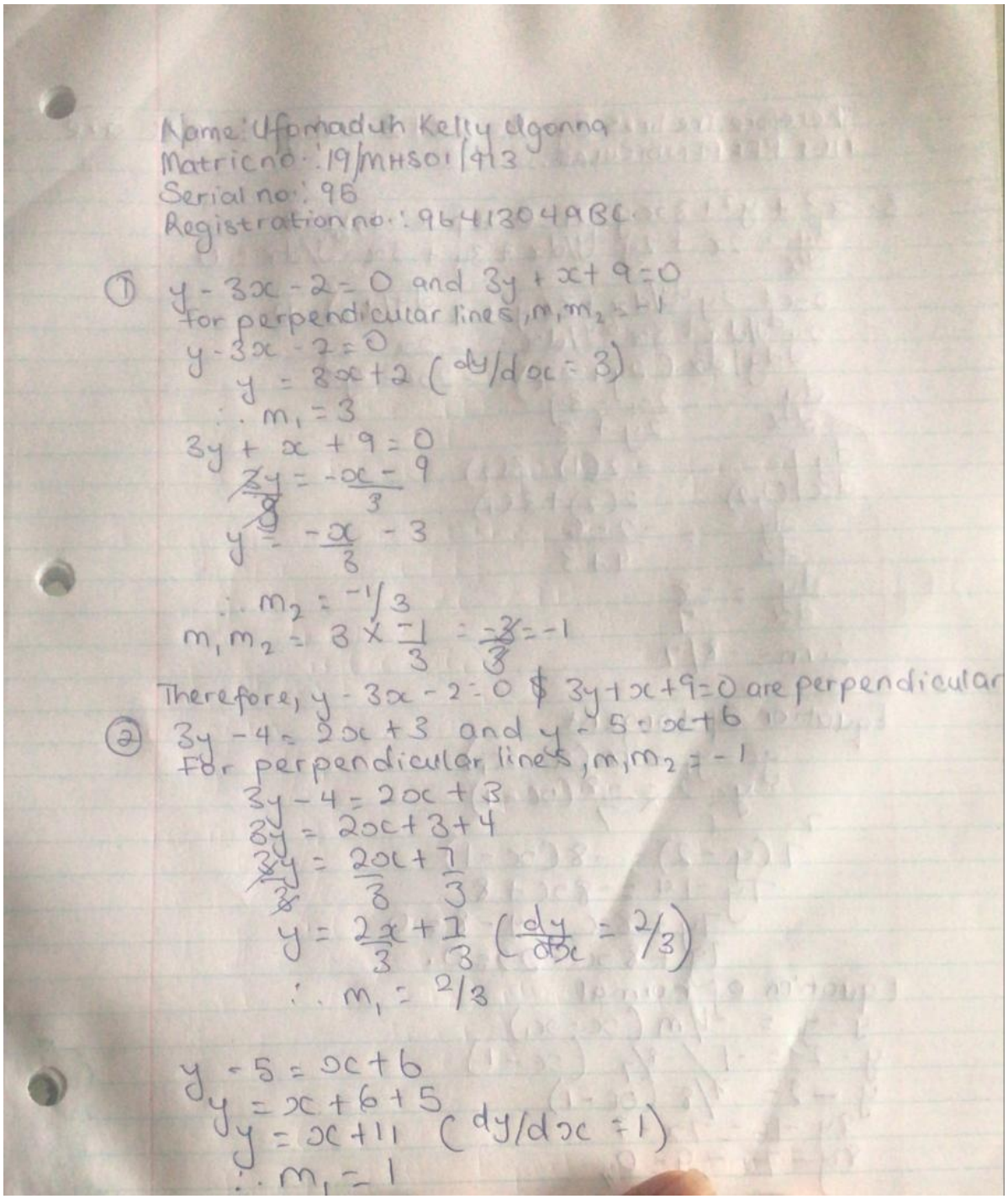
Ufomaduh Kelly Ugonna 19/MHS01/413



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① $y - 3x - 2 = 0$ and $3y + x + 9 = 0$
for perpendicular lines, $m_1 m_2 = -1$

$y - 3x - 2 = 0$
$y = 3x + 2$ $(dy/dx = 3)$
$\therefore m_1 = 3$

$3y + x + 9 = 0$
$3y = -x - 9$
$y = -\frac{x}{3} - 3$

$\therefore m_2 = -1/3$
$m_1 m_2 = 3 \times \frac{-1}{3} = \frac{-3}{3} = -1$

Therefore, $y - 3x - 2 = 0$ & $3y + x + 9 = 0$ are perpendicular

② $3y - 4 = 2x + 3$ and $y - 5 = x + 6$
For perpendicular lines, $m_1 m_2 = -1$

$3y - 4 = 2x + 3$
$3y = 2x + 3 + 4$
$y = \frac{2x}{3} + \frac{7}{3}$ $\left(\frac{dy}{dx} = 2/3\right)$
$\therefore m_1 = 2/3$

$y - 5 = x + 6$
$y = x + 6 + 5$
$y = x + 11$ $(dy/dx = 1)$
$\therefore m_1 = 1$

Therefore, the lines $3y - 4 = 2x + 3$ and $y - 5 = x + 6$ are NOT PERPENDICULAR.

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

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

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

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

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

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

$\frac{dy}{dx}\Big|_{(1,2)} = \frac{-2(1) - 3(2)}{2(2) + 3(1)}$

$\frac{dy}{dx} = \frac{-2 - 6}{4 + 3}$

$\frac{dy}{dx} = -\frac{8}{7}$

$\therefore m = -8/7$

Equation of tangent

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

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

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

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

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

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

Equation of normal

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

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

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

$8y - 16 = 7x + 7$

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