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MATRIC NO: 19/MHJ01/048
DEPT/COLLEGE: MBBS/MATHS

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

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

solution

Condition for perpendicularity

$m_1 \cdot m_2 = -1$

equation 1; $y-3x-2=0$

$y = mx+c$

$y = 3x+2$

$m = 3$

equation 2; $3y+x+9=0$

$y = mx+c$

$3y = -x+9$

$y = \frac{-1}{3}x + 3$

$m = -1/3$

$m_1 \cdot m_2 = 3 \times -1/3 = -1$

$\therefore$ the two pair of lines $y-3x-2=0$ and $3y+x+9=0$ are perpendicular.

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

solution

equation 1; $3y-4=2x+3$

$3y = 2x+3+4$

$3y = 2x+7$

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

$m = 2/3$

equation 2; $y-5=x+6$

$y = x+6+5$

$y = x+11$

$m = 1$

$m_1 \cdot m_2 = \frac{2}{3} \times 1 = \frac{2}{3}$

$\therefore$ the two pair of lines $3y+4=2x+3$ and $y-5=x+6$ are not perpendicular.

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

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

~~2y+2~~

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

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

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

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

where $x=1$ and $y=2$

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

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

a) equation of the tangent to a curve

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

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

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

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

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

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

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

b) Equation of the normal to a curve

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

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

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

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

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

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

$$8y - 7x = 9$$

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