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Course Maths 104
Dept MBBS
M/N 19/mhs01/122

1) Examine whether or not these pairs of lines are perpendicular to each other
1) $y - 3x - 2 = 0$ and $3y + x + 9 = 0$ 2) $3y - 4 = 2x + 3$ and $y - 5 = x + 6$

Solution

1) $y - 3x - 2 = 0$

$y = mx + c$

$y = 3x + 2$

hence $m = 3$ and $c = 2$

and $3y + x + 9 = 0$

$y = mx + c$

$3y = -x - 9$

$y = -x/3 - 9$

$m_2 = -1/3$

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

They are perpendicular

2) $3y = 2x + 7$

$y = 2/3x + 7/3$

$m = 2/3$

$y = x + 11$

$m = 1$

They are not perpendicular

$m_1 \times m_2 \neq -1$

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

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

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

$\frac{dy}{dx}\Big|_{x=1,y=2} = \frac{-3y-2x}{2y+3x} = \frac{-3(2)-2(1)}{2(2)+3(1)} = -\frac{8}{7}$

$m = -8/7$

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

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

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

$7y+8x-22 = 0$ (equation of tangent)

equation of normal

$m_1 \times m_2 = -1$

$m_2 = 7/8 \quad -8/7 \times 7/8 = -1$

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

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

$7x-7 = 8y-16$

$8y-7x-9 = 0$ (equation of normal)

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