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Courses MAT 104

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

$y = 3x + 2$

$\frac{dy}{dx} = 3$

$m = 3$

$3y + x + 9 = 0$ --(i)

$3y = -x - 9$

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

$\frac{dy}{dx} = -\frac{1}{3} = -\frac{1}{3} = m$

Since gradient of the first equation is negative reciprocal to the 2nd eqn they are perpendicular to each other.

(2) $3y - 4 = 2x + 3$ --(i)

$3y = 2x + 3 + 4$

$3y = 2x + 7$

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

$\frac{dy}{dx} = \frac{2}{3}$

$y - 5 = x + 6(3)$ --(ii)

$y = x + 18 + 5$

$y = x + 23$

$\frac{dy}{dx} = 1$

Since eqn(i) is not negative reciprocal to gradient of equation(ii) They are not perpendicular

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

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

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

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

$\frac{dy}{dx}=\frac{-2x-3y}{3x+2y}$ and $x=1, y=2$

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

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

Gradient of normal $=-\frac{8}{7}$

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

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

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

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

$y=-\frac{8x}{7}+\frac{22}{7}$

Multiplying through by 7

$7y=-8x+22$

$8x+7y-22=0$ — equation of tangent

$M_{Tangent}=-\frac{1}{M_{normal}}=\frac{-1}{-8/7}=7/8$

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

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

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

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

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

$$y = \frac{7x}{8} + \frac{9}{8}$$

Multiply through by 8

$$8y = 7x + 9$$

$$-7x + 8y - 9 = 0$$ — equation of normal