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MAT104
MBBS 17/Mhs01/286

Find the equation of the (a) Tangent (b) Normal of the following curves

1 $y = 2x^2$
(1, 2)

Solu

$\frac{dy}{dx} = 4x$

$m = \left.\frac{dy}{dx}\right|_{x=1} = 4(1)$

$M_1 = 4$

Then the equation of the tangent would be
Using
$y - y_1 = m(x - x_1)$

$y - 2 = 4(x - 1)$
$y - 2 = 4x - 4$
$y - 2 + 4 - 4x = 0$
$y + 2 - 4x = 0$ //
Or
$y - 4x = -2$ //

The equation of the Normal,
$M_2 M_1 = -1$
Such that
$M_2 = \frac{-1}{M_1} = \frac{-1}{4}$

$y - y_1 = m(x - x_1)$
$y - 2 = -1/4(x - 1)$

$y - 2 = -x/4 + 1/4$
multiply through by 4
$4y - 8 = -x + 1$
$4y + x = 1 + 8$
$4y + x = 9$ // ans

2. $y = 3x^2 - 2x$

Q. at the point (2, 8)

Solve

$\frac{dy}{dx} = 6x - 2$

$m = \frac{dy}{dx}\Big|_{x=2} = 6(2) - 2$

$= 12 - 2$

$m_2 = 10$

Equation of Tangent

Using

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

$y - 8 = 10(x - 2)$

$y - 8 = 10x - 20$

$y - 8 + 20 - 10x = 0$

$y + 12 - 10x = 0$ //

Equation for Normal

$M_2 = \frac{-1}{M_1} = \frac{-1}{10}$

$y - 8 = -\frac{1}{10}(x - 2)$

$y - 8 = -\frac{x}{10} + \frac{1}{5}$

Multiply through by 10

$10y - 80 = -x + 2$

$10y + x = 2 + 80$

$10y + x - 82 = 0$ //

3. $y = x^3/2$

$(-1, -1/2)$

Solve

$\frac{dy}{dx} = \frac{2.3x^2 - x^3.0}{4}$

$\frac{dy}{dx} = \frac{6x^2 - 0}{4}$

$\frac{dy}{dx} = \frac{6x^2}{4}$

$m = \frac{dy}{dx}\Big|_{x=-1} = \frac{6(-1)^2}{4}$

$= \frac{6}{4} = \frac{3}{2}$

Equation of Tangent

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

$y - (-1/2) = 3/2(x - (-1))$

$y + 1/2 = 3x/2 + 3/2$

$2y + 1 = 3x + 3$

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

$2y - 2 - 3x = 0$ //

Equation of the Normal

$M_2 = -1 \div 3/2$

$M_2 = -2/3$

$y + 1/2 = -2/3(x + 1)$

$y + 1/2 = \frac{-2x}{3} - 2/3$

4.

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

$3y + 3/2 + 2/1 + 2x = 0$

$3y + 7/2 + 2x = 0$ //

$6y + 7 + 4x = 0$ // ans

4. $y = 1 + x - x^2$

$(-2, -5)$

Sol^n

$\frac{dy}{dx} = 1 - 2x$

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

$m = 1 + 4$

$m_1 = 5$

The equation of the Tangent

$y - y_1 = 5(x - x_1)$

$y - (-5) = 5(x - (-2))$

$y + 5 = 5(x + 2)$

$y + 5 = 5x + 10$

$y + 5 - 10 - 5x = 0$

$y - 5x - 5 = 0$ //

Equation To the Normal

$M_2 = -1/5$

$y + 5 = -1/5 (x + 2)$

$y + 5 = -x/5 - 2/5$

$5y + 25 = -x - 2$

$5y + x + 25 + 2 = 0$

$5y + x + 27 = 0$ //

5. $y = 1/x$

$(3, 1/3)$

Sol^n

$\frac{dy}{dx} = -1 \cdot x^{-1-1}$

$\frac{dy}{dx} = -x^{-2}$

$\frac{dy}{dx} = -\frac{1}{x^2} = \frac{-1}{x^2}$

$m = \frac{dy}{dx}\Big|_{x=3} = \frac{-1}{3^2} = \frac{-1}{9}$

The equation of Tangent

$y - y_1 = -1/9 (x - x_1)$

$y - 1/3 = -1/9 (x - 3)$

$y - 1/3 = -x/9 + 1/3$

$9y - 3 = -x + 3$

$9y + x - 3 - 3 = 0$

$9y + x - 6 = 0$ //

Equation of the Normal

$M_2 = \frac{-1}{-1} \times 9$

$M_2 = 9$

$y - 1/3 = 9(x - 3)$

$y - 1/3 = 9x - 27$

$3y - 1 = 27x - 81$

$3y - 27x - 1 + 81 = 0$

$3y - 27x + 80 = 0$ //.