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DEPARTMENT: MEDICINE AND SURGERY.

MATRIC NO: 19/MHS01/400

COURSE: MAT 104

S/N. 036.

1. $y = 2x^2$ at the point $(1, 2)$

Solution

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

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

$$\therefore m = 4.$$

a. Equation of tangent.

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

$$y - 2 = 4(x - 1)$$

$$y - 2 = 4x - 4$$

$$y - 4x + 2 = 0 \text{ (equation of tangent)}$$

b. Equation of normal

$$m_1 m_2 = -1$$

$$4 \cdot m_2 = -1$$

$$m_2 = -1/4$$

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

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

$$y - 2 = -1/4x + 1/4$$

$$y + 1/4x - 7/4 = 0 \text{ (equation of normal).}$$

2. $y = 3x^2 - 2x$ at point $(2, 8)$

Solution.

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

$$\left.\frac{dy}{dx}\right|_{x=2} = 6(2) - 2 = 10$$

$$\therefore m = 10.$$

a. Equation of tangent

$$y - y_1 = m(x - x_1)$$
$$y - 8 = 10(x - 2)$$
$$y - 8 = 10x - 20$$
$$y - 10x + 12 = 0 \text{ (equation of tangent).}$$

b. Equation of normal.

$$m_1 m_2 = -1$$
$$10 \cdot m_2 = -1$$
$$m_2 = -1/10$$
$$y - y_1 = m(x - x_1)$$
$$y - 8 = -1/10\,(x - 2)$$
$$y - 8 = -1/10\,x + 1/5$$
$$y - 1/10\,x - 39/5 = 0 \text{ (equation of normal)}$$

3. $y = \frac{2x^3}{2}$ at point $(-1, -1/2)$

Solution.

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

$$\left.\frac{dy}{dx}\right|_{x=-1} = \frac{6(-1)^2}{4}$$

$$= \frac{6}{4} = 1.5$$

$$\therefore m = 1.5$$

a. Equation of tangent

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

$y + 1/2 = 1.5(x+1)$

$y + 1/2 = 1.5x + 1.5$

$y + 1.5x - 1 = 0$ (equation of tangent).

b. Equation of normal

$m_1 m_2 = -1$.

$1.5 \cdot m_2 = -1$

$m_2 = -1/1.5$

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

$y + 1/2 = -1/1.5(x+1)$

$y + 1/2 = -1/1.5x - 1/1.5$

$y + 1/1.5x + 7/6 = 0$. (equation of normal)

4. $y = 1 + x - x^2$ at point $(-2, -5)$

Solution

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

$\left.\frac{dy}{dx}\right|_{x=-2} \cdot -2 - 2(-2) = 2$

$\therefore m = 2$.

a. Equation of tangent

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

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

$y + 5 = 2x + 4$

$y - 2x + 1 = 0$. (equation of tangent)

b. Equation of normal

$m_1 m_2 = -1$

$2 \cdot m_2 = -1$

$m_2 = -1/2$

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

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

$y + 5 = -\frac{1}{2}x - 1$

$y + \frac{1}{2}x + 6 = 0$ (equation of normal).

5. $y = \frac{1}{x}$ at point $(3, \frac{1}{3})$.

~~g~~ Solution

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

$$\left.\frac{dy}{dx}\right|_{x=3} \cdot \frac{-1}{x^2} = \frac{-1}{3^2} = -\frac{1}{9}.$$

$\therefore m = -\frac{1}{9}.$

a. Equation of tangent

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

$y - \frac{1}{3} = -\frac{1}{9}(x - 3)$

$y - \frac{1}{3} = -\frac{1}{9}x + \frac{1}{3}.$

$y + \frac{1}{9}x - \frac{2}{3} = 0$ (equation of tangent).

b. Equation of normal

$m_1 m_2 = -1$

$-\frac{1}{9} \cdot m_2 = -1$

$m_2 = 9.$

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

$y - \frac{1}{3} = 9(x - 3)$

$y - \frac{1}{3} = 9x - 27$

$y - 9x + \frac{80}{3} = 0$ (equation of normal).