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19/MHS01/046
MBBS

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

solution

a) For equation of the tangent $[x=1, y=2]$

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

$$m_1 = \frac{dy}{dx}\Big|_{x=x_1}$$

$$m_1 = 4(1) = 4$$

$$y - y_1 = m_1(x - x_1)$$

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

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

$y - 4x + 2 = 0$ is the equation of the tangent

b) For equation of the normal

$$m_2 = \frac{1}{m_1} = \frac{1}{4}$$

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

$$y - 2 = \frac{1}{4}(x - 1)$$

$$\frac{y-2}{1} = \frac{-1}{4}(x-1)$$

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

$$4y - 8 = x + 1$$

$4y + x - 9 = 0$ is the equation of the normal

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

Using quotient rule

$x^3 = u$ and $2 = v$

$\frac{dy}{dx} = \frac{2(3x^2) - x^3(0)}{2^2} = \frac{6x^2}{4}$

$m = \frac{6x^2}{4} = 0$

$m = 6/4 = 3/2$

$m = 3/2$

$y + 1/2 = 3/2 (x+1)$ (multiply through by 2)

$2y + 1 = 3x + 3$

$2y - 3x - 2 = 0$ (equ of the tangent).

5. $y - y_1 = -1/m(x - x_1)$

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

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

$3y + 2x + 3 1/2 = 0$ (equ of a normal.

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

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

$m = 1 - 2(-2)$

$m = 1 - 2(-2)$

$m = 1 + 4$

$m = 5$

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

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

$y + 5 = 5x + 10$

equ of tangent $= y - 5x - 5 = 0$.

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

$2y + 2x = -x - 2$

$2y + x + 2 + 1 = 0$ (equ of normal)

2. To find at point $(3, 1/3)$

$x = 3, y = 1/3$

$m = \frac{dy}{dx} = \frac{x(0) - 1(1)}{x^2}$

$m = \frac{0 - 1}{x^2}$

$m = -1/x^2 = -1/(3)^2 = -1/9$

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

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

$9y - 3 = -x + 3$

$9y + x - 6 = 0$ (equ of tangent)

$m_2 = -1/m_1 = \frac{-1}{-1/9}$

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

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

$m_2 = 9$

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

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

$y - 9x + 26.7 = 0$ (equ of the normal)

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

Solution

a) For the equation of the tangent

$[x = 2, y = 8]$

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

$$m_1 = \frac{dy}{dx}\Big|_{x = x_1}$$

$$m_1 = 6(2) - 2$$

$$m_1 = 12 - 2$$

$$m_1 = 10$$

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

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

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

$$y - 10x + 12 = 0$$ (equation of tangent).

b. For the equation of the normal:

$$m_2 = \frac{-1}{m_1} = \frac{-1}{10}$$

$$y - y_1 = \frac{-1}{m_1}(x - x_1)$$

$$y - 8 = \frac{-1}{m_1}(x - x_1)$$

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

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

$$10(y - 8) = -1(x - 2)$$

$$10y - 80 = -x + 2$$

$\therefore 10y + 8 - 82 = 0$ is the equation of the normal.