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19/MHS01/024
MBBS
MAT 104

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

solution

a $y = 2x^2$

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

$m = \frac{dy}{dx}\Big|_{x_1=1} = 4(1) = 4$

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

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

$y - 2 = 4x - 4$

$y - 4x + 2 = 0 \rightarrow$ equation of tangent

b $m = \frac{-1}{4}$

$y - y_1 = \frac{-1}{4}(x - x_1)$

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

$4y - 8 = -x + 1$

$4y + x - 9 = 0 \rightarrow$ equation of normal

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

solution

a] $y = 3x^2 - 2x$

$dy/dx = 6x - 2$

$m = \frac{dy}{dx}\Big|_{x_1=2} = 6(2) - 2 = 10$

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

$y - 8 = 10x - 20$

$y - 10x + 16 = 0 \longrightarrow$ equation of tangent

b] $y - y_1 = \frac{-1}{10}(x - x_1)$

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

$10y - 80 = -x + 2$

$10y + x - 82 = 0$ — equation of normal

3 $y = \frac{x^3}{2}$ at the point $(-1; -\frac{1}{2})$

Solution

a Apply quotient rule

$u = x^3$, $du/dx = 2x^2$

$v = 2$, $dv/dx = 0$

$$\frac{dy}{dx} = \frac{v\,du/dx - u\,dv/dx}{v^2}$$

$$= \frac{2(2x^2) - x^3(0)}{2^2}$$

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

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

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

$$m = \left.\frac{dy}{dx}\right|_{x_1 = -1} = (-1)^2 = 1$$

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

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

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

$y - x - \frac{1}{2} = 0 \longrightarrow$ equation of tangent

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

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

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

$y - x + \frac{3}{2} = 0 \longrightarrow$ equation of normal

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

Solution

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

$m = \frac{dy}{dx}\Big|_{x_1 = -2} = 1 - 2(-2) = 5$

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

~~$y + 5 =$~~

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

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

$y + 5 = 5x + 10$

$y - 5x - 5 = 0 \longrightarrow$ equation of tangent

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

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

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

$5y + 25 = -x - 2$

$5y + x + 27 = 0 \longrightarrow$ equation of normal

5 $y = 1/x$ at the point $(3, 1/3)$

Solution

a $y = x^{-1}$

$dy/dx = -x^{-2}$

$m = \frac{dy}{dx}\Big|_{x_1 = 3} = -(3)^{-2} = \frac{-1}{3^2} = \frac{-1}{9}$

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

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

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

$9y - 3 = -x + 3$

$9y + x - 6 = 0 \longrightarrow$ equation of tangent

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

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

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

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

$y - 9x + 80/3 = 0 \longrightarrow$ equation of normal