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ASSIGNMENT SOLUTIONS

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

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

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

Equ of Tangent:

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

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

$y - 2 = 4x - 4$

$y - 4x = -4 + 2$

$y - 4x = -2$

$y - 4x + 2 = 0$ {equ of tangent}

Equ of normal:

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

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

$4y - 8 = -x + 1$

$4y + x = 1 + 8$

$4y + x = 9$

$x + 4y - 9 = 0$ {equ of normal}

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

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

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

Eqn of tangent :-

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

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

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

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

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

$27y + 3x = 1 + 81$

$27y + 3x = 82$

$3x + 27y - 82 = 0$ {eqn of tangent}

Eqn of normal :-

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

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

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

$y - 3 = 9x - 3$

$y - 9x = -3 + 3$

$y - 9x = 0$

$\therefore y - 9x = 0$ {eqn of normal}

Eqn of tangent :-

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

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

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

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

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

$4y + 2 = 6x + 6$

$4y - 6x = 6 - 2$

$4y - 6x = 4$

$4y - 6x - 4 = 0$ {eqn of tangent}

Eqn of normal :-

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

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

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

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

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

$6y + 3 = -4x - 2$

$6y + 4x = -2 - 3$

$6y + 4x = -5$

$4x + 6y + 5 = 0$ {eqn of normal}

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

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

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

$= 1 + 4$

$= 5$

Eqn of tangent :

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

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

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

$y + 2 = 5x + 25$

$y - 5x = 25 - 2$

$y - 5x = 23$

$y - 5x - 23 = 0$ {eqn of tangent}

Eqn of normal :

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

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

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

$5y + 10 = -x - 5$

$5y + x = -5 - 10$

$5y + x = -15$

$x + 5y + 15 = 0$ {eqn of normal}

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

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

$= -x^{-2}$

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

Eqn of tangent:-

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

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

$y - 8 = 10x - 20$

$y = 10x - 20 + 8$

$y = 10x - 12$

$y - 10x + 12 = 0$ ∴ eqn of tangent

Eqn of normal:-

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

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

$10y - 80 = -x + 2$

$10y + x = 2 + 80$

$10y + x = 82$

$x + 10y - 82 = 0$ ∴ eqn of normal

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

$\frac{dy}{dx}$ = Using quotient

$$\frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2}$$

let $u = x^3$ $\frac{du}{dx} = 3x^2$

let $v = 2$ $\frac{dv}{dx} = 0$

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

$$= \frac{3x^2}{2}$$

$\therefore \frac{dy}{dx} = \frac{3x^2}{2}$

To find m: $\left.\frac{dy}{dx}\right|_{x=-1}$ $\frac{3(-1)^2}{2} = \frac{3}{2}$