Assignment

1. $y = 2x^2$ at point $\{1, 2\}$
2. $y = 3x^2 - 2x$ at point $(2, 8]$
3. $y = \frac{x^3}{2}$ at point $\{-1, -1/2\}$
4. $y = 1 + x - x^2$ at point $\{-2, -5\}$
5. $y = \frac{1}{x}$ at point $\{3, 1/3\}$

Soln

1. $y = 2x^2$ at point $\{1, 2\}$

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

$$\frac{dy}{dx}\Big|_{x=1} = 4 \cdot 1 = 4$$

$M = 4$

$y - y_0 = M(x - x_1)$

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

$y - 2 = 4x - 4$

$y - 4x + 2 = 0$ which gives the eqn of tangent

For eqn of Normal

$M_1 M_2 = -1$

$4 \cdot M_2 = -1$

$M_2 = -1/4$

$y - y_1 = M_2[x - x_1]$

$y - 2 = -1/4\{x - 1\}$

$4y - 8 = -x + 1$

$4y + x - 9 = 0$ which gives the eqn of Normal

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

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

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

$M = 10$

$y - y_1 = M[x - x_1]$

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

$y - 8 = 10x - 20$

$y - 10x + 12 = 0$ which gives the eq of tangent

for eq of Normal

$M_1 M_2 = -1$

$10 \cdot M_2 = -1$

$M_2 = -1/10$

$y - y_1 = M_2[x - x_1]$

$y - 8 = -1/10\{x - 2\}$

$10y - 80 = -x + 2$

$10y + x - 82 = 0$ which gives the eq of the Normal

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

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

$$\left.\frac{dy}{dx}\right|_{x=-1} \quad \frac{3.(-1)^2}{2} = 3/2$$

$$M = 3/2$$

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

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

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

~~$2y - 3x = 0$~~ which gives ~~the eq of the tangent~~

$2y - 3x - 2 = 0$ which gives the eq of the tangent

For eq of the Normal

$$M_1 M_2 = -1$$

$$\frac{3}{2} \cdot M_2 = -1$$

$$M_2 = -1/3/2$$

$$M_2 = -2/3$$

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

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

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

$3y + 2x + \frac{7}{2} = 0$ this eq gives the eq of the Normal

$6y + 4x + 7 = 0$ which gives the eq of the Normal

4 $y = 1 + x - x^2$ at point $\{-2, -5\}$

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

$\frac{dy}{dx}\Big|_{x=-2}$ $1 - 2.-2 = 5$

$M = 5$

$y - y_1 = M\{x - x_1\}$

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

$y + 5 = 5x + 10$

$y - 5x - 5 = 0$ which gives the eq of the target.

For eq of the Normal

$M_1 M_2 = -1$

$5 . M_2 = -1$

$M_2 = -1/5$.

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

$5y + 25 = -x - 2$

$5y + x + 27 = 0$ which gives the eq of the Normal.

5 $y = 1/x$ at Point $\{3, 1/3\}$

$y = x^{-1}$

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

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

$M = -1/9$

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

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

$9y - 3 = -x + 3$

$9y + x - 6 = 0$ which gives the eqn of the tangent

For the eqn of Normal

$M_1 M_2 = -1$

$-1/9 \cdot M_2 = -1$

$M_2 = -1/-1/9 = 9$

$y - y_1 = M_2\{x - x_1\}$

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

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

$y - 9x - \frac{1}{3} + 27 = 0$

$y - 9x + \frac{80}{3} = 0$

$3y - 27x + 80 = 0$ which gives the eqn of Normal