$m_2 = 1$

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

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

$y + 5 = x + 2$

$y - x + 5 - 2 = 0$

$y - x + 3 = 0$

[Equation of the normal.]

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

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

$= -1x^{-1-1}$

$= -1x^{-2}$.

$m = -1/x^2$

$m = 1/2 \quad m = -1/1^2$

$m = -1/1$

$m = 1$

$x_1 = 3, y_1 = 1/3$

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

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

$y - 1/3 = -x + 3$

$3y - 1 = -3x + 9$

$3y + 3x - 1 - 9 = 0$

$3y + 3x - 10 = 0$ [Equation of the tangent].

b. $m_2 = \frac{-1}{m_1}$

$m_2 = 1$

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

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

$3y - 1 = 3x - 9$

$3y - 3x - 1 + 9 = 0$

$3y - 3x + 8 = 0$

[Equation of the normal].

2. $y = 3x^2 - 2x \quad (2, 8)$

$\frac{dy}{dx}\Big|_{x \to 1} = 6x - 2$

$m = 6(1) - 2$

$m = 4.$

$y_1 = 8, \; x_1 = 2$

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

$y - 8 = 4(x - 2)$

$y - 8 = 4x - 8$

$y = 4x - 8 + 8$

$y = 4x + 0$ (equation of the tangent).

b. Equation of the normal.

$m_1 m_2 = -1$

$4 m_2 = -1$

$m_2 = -1/4$

$y - y_1 = m_2 (x - x_1)$

$y - 8 = -1/4 (x - 2)$

$4y - 32 = -x + 2$

$4y + x - 32 - 2 = 0$

$4y + x - 34 = 0$ //

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

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

$m = \frac{3(1)^2}{2}$

$m = 3/2 \quad x_1 = -1 \quad y_1 = -1/2$

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

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

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Assignment:

For the curves in Problem 1 to 5, at the Points given. find a) the Equation of the tangent and b) the Equation of the normal.

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

Solution:

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

$M = 4 \times 1$

$M = 4.$

$x_1 = 1, \quad y = 2.$

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

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

$y - 2 = 4x - 4$

$y = 4x - 4 + 2.$

$y = 4x - 2$ (Equation of the tangent).

b. Equation of the normal.

$M_1 M_2 = -1$

$M_2 = \frac{-1}{M_1}.$

$M_2 = -1/4$

$y - y_1 = M_2(x - x_1)$

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

$\Rightarrow 4y + x - 9 = 0$

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

$2y+1 = 3x+3$

$2y - 3x + 1 - 3 = 0$

$2y - 3x - 2 = 0$ [Equation of the tangent].

b. Equation of a normal.

$m_1 m_2 = -1$

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

$m_2 = \frac{-1}{3/2}$

$m_2 = -2/3$

$y - y_1 = m_2(x - x_1)$

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

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

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

Multiply although by 2.

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

$6y + 4x + 3 + 4 = 0$

9a. $y = 1 + x - x^2$ at Point $(-2, -5)$

$\frac{dy}{dx}\Big|_{x \to 1} = -1 + 1 - 2x$

$m = 1 - 2x$

$m = 1 - 2 \times 1$

$m = 1 - 2$

$m = -1 \quad x_1 = -2, \; y_1 = -5$

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

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

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

$y + x + 5 + 2 = 0$

$y + x + 7 = 0$ [Equa

thetar

b. Equation of th

normal.

$m_1 m_2 = 1$

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

$m_2 = -1$