NAME: ADIPATISO OSATAMEH STEPHANIE
DEPARTMENT: MEDICINE AND SURGERY
COLLEGE: MEDICAL AND HEALTH SCIENCE
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Assignment

For the curves in problem 1 to 5, at the point given, find a) the equation of the tangent and b) the equation of the normal

1 ~~$y = 2x^2$ at the point $(1, 2)$~~
~~For equation of tangent~~
~~$y = mx + c$~~
~~$y = 2x^2$~~

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

$m = \frac{dy}{dx} = 4x$ $\quad x_1 = 1, \; y_1 = 2$

when $x_1 = 1$

$m = 4(1) = 4$

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

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

$y - 2 = 4x - 4$

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

$y - 4x + 2 = 0$

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

$m_1 m_2 = -1$

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

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

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

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

$4y - 8 = -x + 1$

$4y + x - 9 = 0$//

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

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

$m_1 = \frac{dy}{dx} = 6x - 2$ $\quad x_1 = 2, \; y_1 = 8$

when $x_1 = 2$

$m_1 = 6(2) - 2 = 10$

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

$y - 8 = 10x - 20$

$y - 10x - 8 + 20 = 0$

$y - 10x + 12 = 0$//

The equation of the tangent is

$y - 10x + 12 = 0$//

$m_1 m_2 = -1$

$10 m_2 = -1$

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

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

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

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

$10y + x - 80 - 2 = 0$

$10y + x - 82 = 0$

The equation for the normal is

$10y + x - 82 = 0$//

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

$m_1 = \frac{dy}{dx} = \frac{3x^2}{2}$ $\quad x_1 = -1, \; y_1 = -\frac{1}{2}$

$m_1 = \frac{3(-1)^2}{2} = \frac{3}{2}$

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

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

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

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

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

The equation for the tangent is

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

$m_1 m_2 = -1$

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

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

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

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

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

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

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

$3y + 2x + \frac{3}{2} + 2 = 0$

$3y + 2x + \frac{7}{2} = 0$

The equation of the normal is

$3y + 2x + \frac{7}{2} = 0$//

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

$m_1 = \frac{dy}{dx} = -2x + 1$ $\quad x_1 = -2, \; y_1 = -5$

when $x_1 = -2$

$m_1 = -2(-2) + 1$

$m_1 = 4 + 1$

$m_1 = 5$

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

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

$y + 5 = 5x + 10$

$y - 5x - 5 = 0$//

The equation of the tangent is

$y - 5x - 5 = 0$//

$m_1 m_2 = -1$

$m_2 = \frac{-1}{5}$

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

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

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

$5y + 25 = -x - 2$

$5y + x + 27 = 0$//

The equation of the normal is

$5y + x + 27 = 0$//

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

$m_1 = \frac{dy}{dx} = \frac{-1}{x^2}$ $\quad x_1 = 3, \; y_1 = \frac{1}{3}$

$m_1 = -\frac{1}{x^2} = -\frac{1}{3^2} = -\frac{1}{9}$

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

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

$9y - 3 = -x + 3$

$9y + x - 6 = 0$//

The equation of the tangent is

$9y + x - 6 = 0$//

$m_1 m_2 = -1$

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

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

$+1 \times +9$

$m_2 = 9$

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

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

$3y - 1 = 27(x - 3)$

$3y - 27x + 81 - 1 = 0$

$3y - 27x + 80 = 0$//

The equation of the normal ↑