Anugwu Franklin Chiemelie
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MBBS

Assignment

Question: For the curves in problems 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)
2] $y = 3x^2 - 2x$ at the point (2, 8)
3] $y = x^3/2$ at the point $(-1, -\frac{1}{2})$
4] $y = 1 + x - x^2$ at the point (-2, -5)
5] $y = 1/x$ at the point $(3, \frac{1}{3})$

Answers

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

$dy/dx = 4x$

$m_1 = dy/dx|_{x=1} = 4(1) = 4$

a → Equation of a tangent

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

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

$y = 4x - 4 + 2$

$y = 4x - 2$

$y - 4x + 2 = 0$

b → Equation of a normal

$m_2 = \frac{-1}{m_1} = -\frac{1}{4}$

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

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

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

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

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

$4y - 8 = -x + 1$

$4y + x - 9 = 0$

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

$dy/dx = 6x - 2$

$m_1 = dy/dx|_{x=2} = 6(2) - 2 = 10$

a → Eqn of a tangent

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

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

$y - 8 = 10x - 20$

$y - 10x + 12 = 0$

b → Eqn of a normal

$m_2 = \frac{-1}{m_1} = -\frac{1}{10}$

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

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

$y - 8 = -x/10 + 2/10$

$y - 8 = \frac{-x + 2}{10}$

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

$10y - 80 = -x + 2$

$10y + x - 82 = 0$

3] $y = x^3/2$ at points $(-1, -1/2)$

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

$m_1 = dy/dx|_{x=-1} = \frac{3(-1)^2}{2} = 3/2$

a → Equation of a tangent

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

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

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

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

$2y + 1 = 3x + 3$

$2y - 3x - 2 = 0$

b → Equation of a normal

$m_2 = \frac{-1}{m_1} = \frac{-1}{3/2} = -\frac{2}{3}$

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

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

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

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

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

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

$3y + 2x + 7/2 = 0$

$6y + 4x + 7 = 0$

4] $y = 1 + x - x^2$ at points $(-2, -5)$

$dy/dx = 1 - 2x$

$m_1 = dy/dx|_{x=-2} = 1 - 2(-2) = 5$

a → Equation of a tangent

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

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

$y + 5 = 5x + 10$

$y - 5x - 5 = 0$

b → Equation of a normal

$m_2 = \frac{-1}{m_1} = \frac{-1}{5}$

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

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

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

$5y + 25 = -x - 2$

$5y + x + 27 = 0$

5] $y = 1/x$ at points $(3, 1/3)$

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

$m_1 = dy/dx\,|_{x=3} = \frac{-1}{(3)^2} = -1/9$

a → Equation of a tangent

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

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

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

$9y - 3 = -x + 3$

$9y + x - 6 = 0$

b → Equation of a normal

$m_2 = \frac{-1}{m_1} = \frac{+1}{+1/9} = 9$

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

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

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

$y - 9x + 27 - 1/3 = 0$

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

$3y - 27x + 80 = 0$