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MAT 104 assignment 07
Serial number 443

1) $y = 2x^3$ at the point $(1,2)$

Solution

$y = 2x^2$

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

$m = \left.\frac{dy}{dx}\right|_{x \to x_1} = 4(1) = 4$

Equation of tangent

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

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

$y - 2 = 4x - 4$

$y = 4x - 2$

Equation of normal

$y - y_1 = -\frac{1}{m}(x - x_1)$; $m_2 = -\frac{1}{4}$

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

$4y - 8 = -x + 1$

$4y = -x + 9$

$y = \frac{-(x-9)}{4}$

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

Solution

$y = 3x^2 - 2x$

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

$m = \left.\frac{dy}{dx}\right|_{x \to x_1} = 6(2) - 2 = 10$

Equation of tangent

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

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

$y - 8 = 10x - 20$

$y = 10x - 12$

Equation of normal

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

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

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

$10y - 80 = -x + 2$

$10y = -x + 82$

$y = \frac{-(x - 82)}{10}$

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

Solution

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

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

$m = \left.\frac{dy}{dx}\right|_{x \to x_1} = \frac{3}{2}(-1)^2 = \frac{3}{2}$

Equation of tangent

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

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

$2y + 1 = 3x + 3$

$2y = 3x + 2$

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

Equation of normal

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

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

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

$6y + 3 = 2(-2x - 2)$

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

$6y = -4x - 7$

$y = -\frac{(4x + 7)}{6}$

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

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

$m = \frac{dy}{dx}_{x \to -2} = 1 - 2(-2) = 1 + 4 = 5$

Equation of a tangent

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

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

$y + 5 = 5x + 10$

$y = 5x + 5$

Equation of normal

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

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

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

$5y + 25 = -x - 2$

$5y = -x - 27$

$y = \frac{-(x + 27)}{5}$

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

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

$\frac{dy}{dx}_{x \to 3} = -\frac{1}{9} = m$

Equation of a tangent

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

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

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

$27y - 9 = -3x + 9$

$27y = -3x + 18$

$y = \frac{-3x + 18}{27}$

$y = \frac{-(x - 6)}{9}$

Equation of normal

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

$m_2 = 9$

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

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

$3y - 1 = 27x - 81$

$3y = 27x - 80$

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