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19/MHS01/415
MAT 104 ASSIGNMENT

(a) 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 $(1, 2)$.

$dy/dx = 4x$

$dy/dx\,x=1 = 4(1) = 1$

$m = 4$ $\quad x_1 = 1$ $\quad y_1 = 2$

Eqn of a tangent

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

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

$y - 2 = 4x - 4$

$y = 4x - 2$

Equation of the normal

$m_2 = -1/m_1$

$m_1 = -1/4$

$y - y_1 = -1/m_2 (x - x_1)$

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

$y - 2 = -1/4 x + 1/4$

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

$4y - 8 = -x + 1$

$4y + x - 8 - 1 = 0$

$4y + x - 9 = 0$

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

$dy/dx = 6x - 2$

$dy/dx|_{x=2} = 6(2) - 2 = 12 - 2 = 10$

$m = 10$

Eqn of tangent

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

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

$y - 8 = 10x - 20$

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

$y - 10x + 12 = 0$

Eqn of normal

$y - y_1 = -1/m (x - x_1)$

$y - 8 = -1/10 (x - 2)$

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

$10y - 80 = -x + 2$

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

$10y + x - 82 = 0$

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

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

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

$m = 3/2$

Eqn of tangent

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

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

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

$2y + 1 = 3x + 3$

$2y = 3x + 4$

$2y - 3x - 4 = 0$

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Eqn of normal

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

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

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

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

$6y + 4x + 7 = 0$

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

$dy/dx = m = (1 - 2x)$

$m = 1 - 2x$ at $x = -2$ $\quad 1 - 2(-2)$.

$m = 5$.

Eqn of tangent

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

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

$y = 5x + 10 - 5$

$y = 5x + 5$.

$y - 5x - 5 = 0$

Eqn of normal

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

$5y + 25 = -x - 2$

$5y + x + 25 + 2 = 0$

$5y + x + 27 = 0$

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

$y = x^{-1}$

$dy/dx = -1/x^2$

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

equation of tangent

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

$9y - 3 = -x + 3$

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

$9y + x - 9 = 0$.

eqn of normal

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

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

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

$3y - 1 = 27x - 81$

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

$3y + 27x + 80 = 0$.