OHIOMOBA BRITGILE IJEOMA

19/MHS01/303

MBBS (MEDICINE AND SURGERY)

1. $y = 2x^2$ at point $(1, 2)$ (x_1, y_1)

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

$\frac{dy}{dx}|_{x=1} = 4(1) = 4 \quad \therefore m_1 = 4$

a) Equation of a tangent

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

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

$y - 2 = 4x - 4$

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

$y - 4x + 2 = 0$

b) Equation of a normal

$m_1 m_2 = -1$

$4 m_2 = -1$

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

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

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

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

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

$4y - 8 = -x + 1$

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

$4y + 8 - 9 = 0$

2.) $y = 3x^2 - 2x$ at $(2, 8)$ (x_1, y_1)

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

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

$\therefore m_1 = 10$

a) Equation of a tangent

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

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

$y - 8 = 10x - 20$

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

$y - 10x + 12 = 0$

b) Equation of a normal

$m_1 m_2 = -1$

$10 m_2 = -1$

$m_2 = -1/10$

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

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

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

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

$10y - 80 = -x + 2$

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

$10y + x - 82 = 0$

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3. $\frac{x^3}{2}$ at point $(-1, -1/2)$ (x_1, y_1)

$\frac{dy}{dx}$ using quotient rule

$= \frac{V\frac{dy}{dx} - U\frac{dv}{dx}}{V^2}$

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

$2 - y \quad \frac{dv}{dx} = 0$

$= \frac{2(3x^2) - x^3(0)}{2^2} = \frac{6x^2}{4}$

$\frac{dy}{dx}|x=-1 = \frac{6(-1)^2}{4} = \frac{6}{4} \therefore m_1 = \frac{6}{4}$

a) Equation of a tangent

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

$y - (-1/2) = \frac{6}{4}(x - (-1))$

$y + 1/2 = \frac{6}{4}(x+1)$

$y + 1/2 = \frac{6x+6}{4}$

$\frac{2y+1}{2} = \frac{6x+6}{4}$

$4(2y+1) = 2(6x+6)$

$8y + 4 = 12x + 12$

$8y - 12x + 4 - 12 = 0$

$8y - 12x - 8 = 0$

b) Equation of a normal

$m_1 m_2 = -1$

$\frac{6}{4} m_2 = -1$

$m_2 = -1 \div \frac{6}{4}$

$m_2 = -\frac{4}{6}$

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

$y - (-1/2) = -\frac{4}{6}(x - (-1))$

$y + 1/2 = \frac{-4}{6}(x+1)$

$\frac{2y+1}{2} = \frac{-4x-4}{6}$

$6(2y+1) = 2(-4x-4)$

$12y + 6 = -8x - 8$

$12y + 8x + 6 + 8 = 0$

$12y + 8x + 14 = 0$

4.) $y = 1 + x - x^2$ at point $(-2, -5)$ (x_1, y_1)

$\frac{dy}{dx} = 0 + 1 - 2x$

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

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

$= 1 - (-4)$

$= 1 + 4 = 5$

$\therefore m_1 = 5$

a) Equation of a tangent.

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

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

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

$y + 5 = 5x + 10$

$y - 5x + 5 - 10 = 0$

$y - 5x - 5 = 0$

b) Equation of a tangent

$m_1 m_2 = -1$

$5 m_2 = -1$

$m_2 = -1/5$

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

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

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

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

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

$5y+25 = -x-2$

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

$5y+x+27 = 0$

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

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

$= -x^{-2}$

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

$= -(3)^{-2}$

$= \frac{1}{9}$ $\therefore m_1 = -1/9$

a) Equation of a tangent

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

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

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

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

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

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

$27y+3x-18=0$

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

b) Equation of a normal

$m_1 m_2 = -1$

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

$m_2 = -1 \div -1/9 = 9$

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

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

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

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

$3y-1 = 3(9x-27)$

$3y-1 = 27x-81$

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

$3y+27x-80=0$