31/03/2020

NAME: OTEMIKE OGORCHUKWU CLARA.
MATRIC NUMBER: 19/MHS01/376.
SERIAL NUMBER: 168
JAMB REG NUMBER: 95505326AD
DEPARTMENT: MBBS.
COLLEGE OF MEDICINE AND HEALTH SCIENCES.
COURSE CODE: MAT 104

Assignment 8

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 $(1, 2)$.
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 $(3, \frac{1}{3})$.

Solution.

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

$\frac{dy}{dx} = 4x = 4(1)$

$m = 4$

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

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

$y - 2 = 4x - 4$

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

$y - 4x + 2 = 0$ which gives the equation of the tangent.

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

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

$4y - 8 = -x + 1$

$4y + x - 8 - 1$

$4y + x - 9 = 0$ which gives the equation of the normal.

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

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

$m = 10$

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

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

$y - 8 = 10x - 20$

$y - 10x - 8 + 20 = 0$ which gives the equation of tangent

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

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

$10y - 80 = -x + 2$

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

$10y + x - 82 = 0$ which gives the equation of the normal

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

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

$m = 3$

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

$y - (-1/2) = 3[x - (-1)]$.

$y + 1/2 = 3[x + 1]$

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

$y - 3x + 1/2 - 3$

$y - 3x - 5/2 = 0$ which gives the equation of tangent.

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

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

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

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

$3y + x + 3/2 + 1 = 0$

$3y + x + 5/2 = 0$ which gives the equation of the normal.

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

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

$m = 4$

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

$[y - (-5)] = 4[x - (-2)]$

$y + 5 = 4(x + 2)$

$y + 5 = 4x + 8$

$y - 4x + 5 - 8 = 0$

$y - 4x - 3 = 0$ which gives the equation of tangent.

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

$[y - (-5)] = -1/4\,[x - (-2]$

$4(y + 5) = -1(x + 2)$

$4y + 20 = -x - 2$

$4y + x + 20 + 2 = 0$.

$4y + x + 22 = 0$ which gives the equation of the normal.

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

~~$y = x^{-1}$~~ ~~$dy/dx = x$~~ $y = x^{-1}$

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

$m = -1/9$.

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

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

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

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

$y + 1/9x - 2/3 = 0$ which gives the equation of tangent

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

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

$-1/m = 9$

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

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

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

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

$y - 9x + 80/3 = 0$ which gives the equation of the normal.