1st April, 2020

Name: Johnson Mojoyinoluwa Divine
Matric no: 19/MHS01/222
Department: Medicine and Surgery

① $y = 2x^3$ at point $(1,2)$

Solution

$x_1 = 1, y_1 = 2, y = 2x^3$

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

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

$m = 4$

Equation of tangent $= y - y_1 = m(x - x_1)$

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

$y - 2 = 4x - 4$

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

$y - 4x + 2 = 0$

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

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

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

$4y - (-x) = +8 + 1$

$4y + x = 9 = 0$

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

$dy/dx = 6x - 2$, $x_1 = 2$, $y = 8$, $y = 3x^2 - 2x$

$\frac{dy}{dx}\Big|_{x_1 = 2}$ $6(2) - 2$

$12 - 2$

$m = 10$

Equation of tangent $= y - y_1 = m(x - x_1)$

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

$y - 8 = 10x - 20$

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

$y - 10x + 12 = 0$

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

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

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

$10y - 80 = -x + 2$

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

~~$10y + x - 82 = 0$~~ $10y + x - 82 = 0$

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

$y = x^3/2$, $x_1 = -1$, $y = -1/2$

$dy/dx = 3x^2/2$

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

$m = \frac{3}{2}$

Equation of tangent $= y - y_1 = m(x - x_1)$

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

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

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

$2y + 1 = 3x + 3$

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

$2y - 3x - 2 = 0$

Equation of normal: $y - y_1 = \frac{-1}{m}(x - x_1)$

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

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

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

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

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

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

$6y + 4x + 7 = 0$

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

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

solution

$y = 1 + x - x^2, x_1 = -2, y_1 = -5$

$dy/dx = 1 - 2x$

$\frac{dy}{dx}\Big|_{x=-2}$ $\quad m = 1 - 2(-2)$

$1 + 4 = 5$

$m = 5$

Equation of tangent: $y - y_1 = m(x - x_1)$

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

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

$y - 5 = 5x + 10$

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

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

$y - 5x - 5 = 0$

Equation of normal: $y - y_1 = \frac{-1}{m}(x - x_1)$

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

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

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

Find LCM and multiply through by 5

$5y + 25 = -x - 2$

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

$5y + x + 27 = 0$

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

$x_1 = 3, y_1 = 1/3, y = 1/x$

$y = x^{-1}$

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

$= -1(x)^{-2}$

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

$\frac{dy}{dx}\Big|_{x=3} = \frac{-1}{3^2} = -1/9$

$m = -1/9$

Equation of tangent: $y - y_1 = m(x - x_1)$

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

$9y - 3 = -x + 3$

$9y - 3 = -x + 3$

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

$9y + x + 6 = 0$

Equation of normal: $y - y_1 = -\frac{1}{m}(x - x_1)$

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

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

~~$9y - x - 3 - 3$~~ $y - 1/3 = -1/1 \times 9/1 (x - 3)$

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

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

$3y - 1 = 27x - 81$

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

$3y - 27x + 80 = 0$