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

$y - y_1 = m_1(x - x_1)$

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

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

$y - \frac{1}{3} = \frac{-x}{9} + \frac{3}{9}$ [multiply through by 9]

$9y - 3 = -x + 3$

$9y + x - 6 = 0$

$\therefore 9y + x - 6 = 0$ is the equation of the tangent

b) for the equation of the normal

$m_2 = \frac{-1}{m_1} = \frac{-1}{-1/9}$

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

$m_2 = 9$

$y - y_1 = \frac{-1}{m_1}(x - x_1)$

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

$y - \frac{1}{3} = 9x - 27$ [multiply by 3]

$3y - 1 = 27x - 81$

$3y - 27x + 80 = 0$

$\therefore 3y - 27x + 80 = 0$ is the equation of the normal.

b) for the equation of the normal

$m_2 = \frac{-1}{m_1} = \frac{-1}{5}$

$\therefore m_2 = -1/5$

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

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

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

$5y + 25 = -x - 2$

$5y + x + 27 = 0$

$\therefore 5y + x + 27 = 0$ is the equation of the normal.

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

Solution

$y = x^{-1}$ $[x_1 = 3 \quad y_1 = 1/3]$

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

a) for the equation of the tangent

$m_1 = \frac{dy}{dx}\Big|_{x = x_1}$

$m_1 = \frac{dy}{dx}\Big|_{x = 3}$

$m_1 = (-3)^{-2}$

$m_1 = -1/3^2$

$m_1 = \frac{6(-1)^2}{4}$

$m_1 = \frac{3}{2}$

$y - y_1 = m_1(x - x_1)$

$y + \frac{1}{2} = \frac{3}{2}(x + 1)$ [multiply through by 2]

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

$2y + 1 = 3x + 3$

$\therefore 2y - 3x - 2 = 0$ is the equation of the tangent.

b) For the equation of the normal

$m_2 = \frac{-1}{m_1} = \frac{-1}{3/2}$

$m_2 = -1 \times \frac{2}{3}$

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

$y - y_1 = \frac{-1}{m_1}(x - x_1)$

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

$y + \frac{1}{2} = \frac{-2x - 2}{3}$ (multiply through by 6)

$6y + 3 = -\frac{2x}{\cancel{3}} \times \cancel{6}^{2} - \frac{2}{\cancel{3}} \times \cancel{6}^{2}$

$6y + 3 = 2(-2x) - 4$

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

$6y + 4x + 7 = 0$

$\therefore 6y + 4x + 7 = 0$ is the equation of the normal.

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

Solution

a) for the equation of the tangent $[x_1 = -2$

$y_1 = -5]$.

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

$$m_1 = \left.\frac{dy}{dx}\right|_{x-x_1}$$

$m_1 = -2(-2) + 1$

$= 5$

$y - y_1 = m_1(x - x_1)$

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

$y + 5 = 5x + 10$

$y - 5x - 5 = 0$ is the equation of the tangent.

N
D. $y - y_1 = \frac{-1}{m_1}(x - x_1)$
M
C $y - 8 = \frac{-1}{10}(x - 2)$

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

$10y - 80 = -x + 2$

$\therefore 10y + 8 - 82 = 0$ is the equation of the normal

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

$x_1 = -1 \quad y_1 = -1/2$

using quotient rule

$$\frac{dy}{dx} = \frac{v\,dy/dx - u\,dv/dx}{v^2}$$

let $v = 2$ and $u = x^3$

$$\frac{dy}{dx} = \frac{2 \cdot 3x^2 - x^3 \cdot 0}{2^2}$$

$$\frac{dy}{dx} = \frac{6x^2}{4}$$

a) for the equation of the tangent

$$m_1 = \frac{dy}{dx}\bigg|_{x = x_1}$$

$$m_1 = \frac{dy}{dx}\bigg|_{x = 1}$$

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

$4y - 8 = -x + 1$

$4y = -x + 1 + 8$

$4y = -x + 9$

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

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

solution

$\{x_1 = 2, y_1 = 8\}$ $\quad \frac{dy}{dx} = 6x - 2$

$m_1 = \left.\frac{dy}{dx}\right|_{x = x_1} = 6(2) - 2$

$6x/-2$ $\quad m = 12 - 2$

$m = 10$

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

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

$y - 8 = 10x - 20$

$\therefore y - 10x + 12 = 0$ is the equation of the tangent.

b) Equation of the normal

$m_2 = \frac{-1}{m_1} = \frac{-1}{10}$

NAME: DALAHOL YOP MARY
DEPARTMENT: MBBS
MATRIC NUMBER: 19/MHS01/132
COURSE: MAT 104

ASSIGNMENT

1) For the curves in problem 1 to 5, at the points given find a) the equation of the tangent
b) The equation of the normal

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

Solution.

equation of the tangent. $\{x_1 = 1, y_2 = 2\}$

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

$m_1 = dy/dx \,|\, x = x_1$

$m_1 = 4(1) = 4$

$y - y_1 = m_1(x - x_1)$

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

$y - 2 = 4x - 4$

$\therefore y - 4x + 2 = 0$ is the equation of the tangent.

b) equation of the normal

$m_2 = \frac{-1}{m_1} = \frac{-1}{4}$

$y - y_1 = \frac{-1}{m_1}(x - x_1)$

$y - 2 = -1/4\{x - 1\}$