[illegible] AARON [illegible]
MATH 104
19/[illegible]/376
SERIAL NO: 63

For the curves in problem 1-5 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. $y = x^3/3$ at the point $(-1, -1/3)$
4. $y = 1 + x - x^2$ at the point (-2, [illegible])
5. $y = 1/x$ at the point $(3, 1/3)$

Answer

(1) $y = 2x^2$ Equation of tangent

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

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

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

$m = 4$

$x_1 = 1 \quad y_1 = 2$

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

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

$y - 2 = 4x - 4$

(a) $y = 4x - 2$ equation of tangent

(b) Equation of the normal

$m_1 m_2 = -1$

$m_2 = -1/4$

$y - y_1 = -1/4(x - x_1)$

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

$4y - 8 = 1 - x$

$4y = 1 - x + 8$

$4y = 9 - x$

$4y - 9 + x = 0$

Equation of the normal

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

$\frac{dy}{dx}$ - Equation of tangent

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

$m = \frac{dy}{dx}\Big|_{x=1} = 6 \times 1 - 2 = 6 - 2 = 4$

$m = 4$

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

$y - 8 = 4(x - 2)$

$y - 8 = 4x - 8$

$y - 4x = 0$

Equation of tangent

(b) Equation of Normal

$m_1 m_2 = -1$

$m_2 = -1/4$

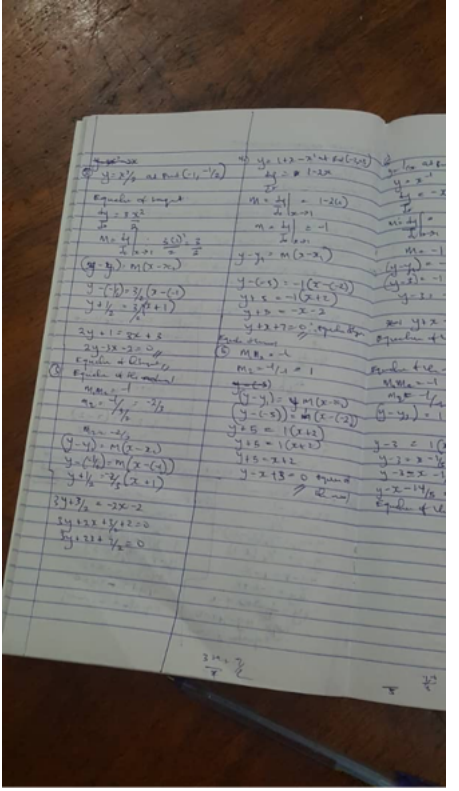
$(y - y_1) = m(x - x_1)$

$y - 8 = -1/4(x - 2)$

$4y - 32 = -x + 2$

$4y + x - 34 = 0$

Equation of the normal



$y = 1+2x - x^2$ at Pt $(-2,-3)$

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

$m = \left.\frac{dy}{dx}\right|_{x=-2} = 1-2(-2)$

$m = \left.\frac{dy}{dx}\right|_{x=-2} = 5$

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

$y - (-3) = 5(x - (-2))$

$y + 3 = 5(x + 2)$

$y + 3 = 5x + 10$

$5x - y + 7 = 0$ equation of tangent

Normal

$m_1 m_2 = -1$

$5 m_2 = -1$

$m_2 = -1/5$

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

$y - (-3) = -\frac{1}{5}(x - (-2))$

$5(y+3) = -1(x+2)$

$5y + 15 = -x - 2$

$x + 5y + 17 = 0$ equation of normal

At Pt $(\frac{1}{2}, \frac{1}{4})$

$y = x^{-1}$

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

$m = \left.\frac{dy}{dx}\right|_{x=\frac{1}{2}} = -\frac{1}{(\frac{1}{2})^2} = -4$

$m = -1$

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

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

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

$4x + 4y + x - 14/5 = 0$

equation of the line

Equation of the normal

$m_1 m_2 = -1$

$m_2 = -1/-1 = 1$

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

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

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

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

$y - x - 14/5 = 0$

Equation of the normal