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

$$y = 2x^2$$
$$\frac{dy}{dx} = 4x$$
$$m = \frac{dy}{dx} = 4x$$
when $x = 1$,
$$m = 4(1)$$
$$\therefore m = 4$$

a. Equation of the tangent to a curve;

$$y - y_1 = m(x - x_1)$$
$$y - 2 = 4(x - 1)$$
$$y - 2 = 4x - 4$$
$$y - 4x = -4 + 2$$
$$y - 4x = -2$$
$$4x - y = +2$$
$$\underline{\underline{4x - y - 2 = 0}}$$

b. Equation of the normal to a curve;

$$y - y_1 = -\frac{1}{m}(x - x_1)$$
$$y - 2 = -\frac{1}{4}(x - 1)$$
$$y - 2 = -\frac{x}{4} + \frac{1}{4}$$
$$4y - 8 = -x + 1$$
$$4y + x = 1 + 8$$
$$4y + x = 9$$
$$\underline{\underline{x + 4y - 9 = 0}}$$

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

$$y = 3x^2 - 2x$$

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

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

when $x = 2$, $\quad m = 6(2) - 2$

$$= 12 - 2$$

$$\therefore m = 10$$

a. Equation of the tangent to a curve;

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

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

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

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

$$y - 10x = -12$$

$$\underline{\underline{10x - y - 12 = 0}}$$

b. Equation of the normal to the curve;

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

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

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

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

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

$$10y + x = 82$$

$$\underline{\underline{x + 8y - 82 = 0}}$$

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

$$y = \frac{x^3}{2}$$

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

$$m = \frac{dy}{dx} = 3x^2$$

when $x = -1$, $m = 3(-1)^2$

$$\therefore m = 3$$

a. Equation of the tangent to a curve;

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

$$y - (-\tfrac{1}{2}) = 3[x - (-1)]$$

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

$$y + \tfrac{1}{2} = 3x + 3$$

$$2y + 1 = 6x + 6$$

$$2y - 6x = 6 - 1$$

$$2y - 6x = 5$$

$$\underline{\underline{6x - 2y + 5 = 0}}$$

b. Equation of the normal to a curve;

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

$$y - (-\tfrac{1}{2}) = -\tfrac{1}{3}[x - (-1)]$$

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

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

$$6y + 3 = -2x - 2$$

$$6y + 2x = -2 - 3$$

$$6y + 2x = -5$$

$$\underline{\underline{2x + 6y + 5 = 0}}$$

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

$$y = 1 + x - x^2$$

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

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

when $x = -2$, $m = 1 - 2(-2)$

$$= 1 + 4$$

$$\therefore m = 5$$

a. Equation of the tangent to the curve;

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

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

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

$$y + 5 = 5x + 10$$

$$y - 5x = 10 - 5$$

$$y - 5x = 5$$

$$\underline{\underline{5x - y + 5 = 0}}$$

b. Equation of the normal to the curve;

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

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

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

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

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

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

$$5y + x = -27$$

$$\underline{\underline{x + 5y + 27 = 0}}$$

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

$$y = 1/x = x^{-1}$$

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

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

when $x = 3$, $m = -(3)^{-2}$

$$= -1/3^2$$

$$\therefore m = -1/9$$

a. Equation of the tangent to the curve;

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

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

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

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

$$9y + x = 3 + 3$$

$$9y + x = 6$$

$$\underline{\underline{x + 9y - 6 = 0}}$$

b. Equation of the normal to the curve;

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

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

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

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

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

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

$$\underline{\underline{27x - 3y - 80 = 0}}$$

19/MHS01/078
Akposiwodor Oghenedoro
MAT 107
MBBS