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MATIC; 19 / MHS01265/
MATHEMATICS 104: GENERAL MATHEMATICS.

Question 1,

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 $(-1, -1/2)$
- 4) $y = 1 + x - x^2$ at the point $(-2, -5)$
- 5) $y = 1/x$ at the point $(3, 1/3)$

Solution

① $y = 2x^2$ at the point $(1, 2)$

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

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

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

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

$$4x - 4 = y - 2$$

$$4x - y = 2$$

* $y = 2x^2$

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

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

$$4 \times m = -1$$

$$m = -1/4$$

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

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

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

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

$$4y + x = 9$$

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

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

$$= 6(2) - 2$$

$$= 12 - 2 = 10$$

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

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

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

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

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

$$10x + y - 12 = 0$$

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

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

$$6(2) - 2 = 10$$

$$10m = -1$$

$$m = -1/10$$

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

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

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

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

$$10y + x - 82 = \underline{0}$$

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

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

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

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

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

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

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

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

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

$$\frac{3}{2} m = -1$$

$$m = -1 \div \frac{3}{2}$$

$$m = -2/3$$

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

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

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

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

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

$$3y + 2x + 7/2 = 0$$

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

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

$$= 1 - 2(-2)$$

$$= 1 + 4 = 5$$

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

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

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

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

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

$$5x - y = -5$$

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

$$= 1 - 2(-2)$$

$$= 5$$

$$5m = -1$$

$$m = -1/5$$

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

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

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

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

$$5y + x - 27 = 0$$

5 $\frac{dy}{dx} = -1x^{-2}$

$$-(3)^{-2} = -1/9$$

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

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

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

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

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

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

$$-(3)^{-2} = -1/9$$

$$-1/9 \cdot 9 = -1$$

$$m = 9$$

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

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

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

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

$$9x - y + 82/3 = 0$$