

Differentiation Exercise I

Differentiation of a Constant

$$y = a \quad a \text{ is a constant}$$

$$\frac{dy}{dx} = 0$$

Example

$$y = 2$$

$$\frac{dy}{dx} = 0$$

$$2. \quad y = x^7$$

$$3. \quad y = x^{111}$$

$$4. \quad y = x^{-3}$$

Exercise 1

Find $\frac{dy}{dx}$ in the exercise below.

$$1. \quad y = 2$$

$$2. \quad y = 210$$

$$3. \quad y = \frac{2}{3}$$

$$4. \quad y = \sqrt{23}$$

$$5. \quad y = x^{-6}$$

$$6. \quad y = x^{-1}$$

$$7. \quad y = x^{\frac{1}{2}}$$

$$8. \quad y = x^{\frac{4}{5}}$$

Differentiation of a Function I

$$y = x^n$$

$$\frac{dy}{dx} = nx^{n-1}$$

Example

$$y = x^3$$

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

$$9. \quad y = x^{\frac{3}{14}}$$

$$10. \quad y = x^{\frac{1}{2}}$$

$$11. \quad y = x^{\frac{2}{3}}$$

Exercise 2

Find $\frac{dy}{dx}$ in the exercise below.

$$1. \quad y = x^2$$

Differentiation of a Function II

$$y = ax$$

$$\frac{dy}{dx} = ax^{1-1} = ax^0 = a$$

Example

$$y = 3x$$

$$\frac{dy}{dx} = 3$$

Exercise 3

Find the $f'(x)$ of the following functions.

1. $f(x) = 6x$

2. $f(x) = -21x$

3. $f(x) = -\frac{1}{3}x$

4. $f(x) = \frac{6}{7}x$

5. $f(x) = \sqrt{25}x$

Differentiation of a Function II

$$y = ax^n$$

$$\frac{dy}{dx} = anx^{n-1}$$

Example

$$y = 2x^3$$

$$\frac{dy}{dx} = 2(3)x^2 = 6x^2$$

Exercise 4

Differentiate the function below.

1. $f(x) = 6x^3$

2. $f(x) = -3x^6$

3. $f(x) = 5x^{-2}$

4. $f(x) = \frac{2}{3}x^3$

5. $f(x) = 25x^{\frac{1}{5}}$

Differentiation of a Fraction Function

$$y = \frac{1}{x^n}$$

Rewrite

$$y = x^{-n}$$

$$\frac{dy}{dx} = -nx^{-n-1} = \frac{-n}{x^{n+1}}$$

Example

$$y = \frac{1}{x}$$

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

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

Additional Notes

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

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

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

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

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

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

Exercise 5

Find the derivative of the function below.

1. $y = \frac{1}{x^2}$

2. $y = \frac{1}{2x^3}$

3. $y = \frac{3}{x}$

4. $y = \frac{7}{x^2}$

5. $y = \frac{15}{x^5}$

8. $y = -\frac{1}{6x^2}$

6. $y = -\frac{2}{x^3}$

9. $y = \frac{1}{3x^6}$

7. $y = \frac{1}{2x^7}$

10. $y = \frac{2}{5x^2}$

$$11. y = -\frac{12}{7x^7}$$

$$12. y = \frac{2}{-9x^3}$$

$$13. y = \frac{2x^6}{-9}$$