

**Dr.SNS RAJALAKSHMI COLLEGE OF ARTS AND SCIENCE  
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Coimbatore- 49**



**DEPARTMENT OF MATHEMATICS**

**21UCR304: BUSINESS CALCULUS AND FINANCIAL  
COMPUTATION**

**FIRST ORDER AND SECOND ORDER DERIVATIVES**

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## First Derivative

The first derivative of a function measures how fast the function is changing at each point. It represents the rate of change or the slope of the curve at any point on the graph.

## Meaning in Simple Words

- It tells whether the function is increasing or decreasing.
- It helps find the slope of the tangent line at a point.

**1. Derivative of a constant is zero**

Example: Derivative of five is zero

**2. Derivative of a sum is the sum of the derivatives**

Example: Derivative of (f plus g) is derivative of f plus derivative of g

**3. Derivative of a product follows the product rule**

Example: Derivative of (f times g) is f times derivative of g plus g times derivative of f

**4. Derivative of a quotient follows the quotient rule**

Example: Derivative of f divided by g uses the formula

(g times derivative of f minus f times derivative of g) divided by g squared

## Second Derivative

The second derivative is the derivative of the first derivative. It tells how the rate of change itself is changing.

## Meaning in Simple Words

- It shows whether a graph is bending upward or downward.
- Helps determine maxima, minima, and concavity of a curve.

1. If the second derivative is positive, the curve bends upward (concave up).
2. If the second derivative is negative, the curve bends downward (concave down).
3. If the second derivative is zero, it may indicate a point of inflection.
4. Second derivative helps classify turning points as maxima or minima.

# Problem 1

Find the first derivative of  
 $y = 3x^2 + 5x + 7$

**Step 1:**

Write the given function

$$y = 3x^2 + 5x + 7$$

**Step 2:**

Differentiate term by term

Derivative of  $3x^2$  is  $6x$

Derivative of  $5x$  is  $5$

Derivative of  $7$  is  $0$

**Step 3:**

Combine all derivative terms

$$y' = 6x + 5$$

**Final Answer:**

$$y' = 6x + 5$$

## Problem 2

Find the first derivative of

$$y = 4x^3 - 2x^2 + 9$$

**Step 1:**

Write the given function

$$y = 4x^3 - 2x^2 + 9$$

**Step 2:**

Differentiate term by term

Derivative of  $4x^3$  is  $12x^2$

Derivative of  $2x^2$  is  $4x$

Derivative of 9 is 0

**Step 3:**

Combine all derivative terms

$$y' = 12x^2 - 4x$$

**Final Answer:**

$$y' = 12x^2 - 4x$$

THANK YOU