# 30 Lecture - MTH101

# **Important Subjective**

### What is the First Fundamental Theorem of Calculus?

**Answer:** The First Fundamental Theorem of Calculus establishes a connection between integration and differentiation. It states that if f(x) is a continuous function on an interval [a, b], then the definite integral of f(x) from a to x is differentiable on the interval (a, b), and its derivative is f(x) evaluated at x.

# What is the significance of the First Fundamental Theorem of Calculus?

**Answer:** The theorem provides a powerful tool for solving problems that involve finding the area under a curve. It allows us to calculate the derivative of the definite integral of a function, which in turn enables us to find the slope of a tangent line to a curve at any point.

### What does the derivative of the definite integral of a function represent?

**Answer:** The derivative of the definite integral of a function represents the slope of the tangent line to the curve at any point.

#### What is the formula for the First Fundamental Theorem of Calculus?

**Answer:** If f(x) is a continuous function on [a, b], then the function g(x) defined by  $g(x) = ?a^x$  f(t) dt is differentiable on (a, b), and g'(x) = f(x) for all x in (a, b).

# What is the relationship between integration and differentiation according to the First Fundamental Theorem of Calculus?

**Answer:** The First Fundamental Theorem of Calculus establishes a relationship between integration and differentiation. It states that the derivative of the definite integral of a function is equal to the original function.

## What is the role of the limit concept in the proof of the First Fundamental Theorem of Calculus?

**Answer:** The proof of the theorem is based on the definition of the definite integral as a limit of Riemann sums. It involves showing that as the number of subintervals in the Riemann sum increases, the sum approaches the definite integral of the function.

# What is the application of the First Fundamental Theorem of Calculus in physics?

**Answer:** The theorem can be used to calculate the total distance traveled by an object whose velocity is given by a function. The definite integral of the velocity function over a given time interval gives the total displacement of the object over that interval, while the derivative of the definite integral gives the instantaneous velocity at any point in time.

# What is the application of the First Fundamental Theorem of Calculus in economics?

**Answer:** The theorem can be used to calculate the present value of future cash flows. It allows us to calculate the integral of the cash flows over a given period, and the derivative of the integral gives the present value of the cash flows at any point in time.

## Is the First Fundamental Theorem of Calculus applicable only to continuous functions?

**Answer:** Yes, the theorem is applicable only to continuous functions.

### What is the difference between the First and Second Fundamental Theorem of Calculus?

**Answer:** The First Fundamental Theorem of Calculus establishes a connection between integration and differentiation, while the Second Fundamental Theorem of Calculus establishes a connection between definite integrals and indefinite integrals. The Second Fundamental Theorem states that if f(x) is a continuous function on an interval [a, b], then the definite integral of f(x) from a to b is equal to the difference between the antiderivative of f(x) evaluated at b and the antiderivative of f(x) evaluated at a.