

# 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  $g(x) = \int_a^x f(t) dt$  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  $a$ .