1. **Antiderivative** 
   1. **Definition**: We say that a function is an antiderivative, if , .
   2. **Example:** A function is defined as . Find .

**Solution:** we can choose or or or where is arbitrary constant.

* 1. **Theorem:** If , then is an arbitrary constant.

**Proof:** let and let .

Since exists point in

exists point in and is continuous on

(By using the mean value theorem)

But .

* 1. **Theorem:** If and are continuous functions and differentiable on , then is an arbitrary constant.

**Proof:** let is defined as .

is constant.

.

* 1. **Definition**: We say that a function is an antiderivative of a function in , if .
  2. **Theorem:** (**Integration formulas**)

1. .
2. .
3. .
4. where is an antiderivative of .

**Applications of Indefinite Integral.**

* 1. **Example:** Find an equation of curve which passes through with its slope on any point on a curve is equal double - axis of these point.

**Solution:** since the slope of curve at is and - axis is

To find the value of , since a curve passes through

where

.

* 1. **Example:** Find the general solution of .

**Solution:**

.

* 1. **Example:** moving point by velocity where represents a time , find where .

**Solution:**

by substituting

.

**Definite Integral**

* 1. **Definition**: Let , then a partition on is a finite set of points such that , and , , max .
  2. **Definition**: Let , are partitions on . We said that is a refinement of , if .
  3. **Example:** Let and let and . Find .

**Solution:** We note that , also

max max max .

max max max .

max max max .

.

* 1. **Notes**:

Let , we can partition into partial intervals

let

but

* 1. **Definition**: Let is a continuous function and let is partition on . Define , let . Cauchy proved a set has limit where , .