**Improper Integral**

**Def:** If either a**ny** one of (or both) the limit of the integral is (or are ) infinite or is infinitely discontinuous or indeterminate at *a* (lower limit) or *b* (upper limit ) or both or at any one or more points between *a* and *b* , then the integral is called an improper integral or infinity integral. The improper integral can be classified into three kinds

1. **Infinite range** : The limit of the integral either lower or upper or both limits are infinite. This type of integrals can be written as
2. provided is integrable in (*a,b*) and this limit exists.
3. provided is integrable in (*a,b*) and this limit exists.

and c arbitrary , provided is integrable in (*a,b*) and this limit exists

Evaluate1

Soln Here upper limit is infinity

Evaluate2

Soln Here lower limit is infinity . So this

integral can be written as

Evaluate3

Soln Here upper and lower limit both are infinity . So this

integral can be written as

+

=

=

=

1. **Integrand Infinitely discontinuous at a point** :

is infinitely discontinuous at lower limit*a,*

*i,e* if then

can be written as provided

is integrable in (*a,b*) and this limit exists.

is infinitely discontinuous at upper limit*b,*

*i,e* if then

can be written as provided

is integrable in (*a,b*) and this limit exists.

is infinitely discontinuous at an internal

point *c, ( i,e* if

then can be written as

provided

is integrable in (*a,b*) and this limit exists

is infinitely discontinuous at both upper and

lower limit*a*and*b,*

*i,e* if then

can be written as

and c arbitrary , where two integrals exists

Evaluate3

Soln Here as So this

integral can be written as

=

Evaluate4

Soln Here as So this

integral can be written as

Evaluate5

Soln Here as So this

integral can be written as

**Convergence and divergence of improper integral**

If the value of exists that is its value is finite then the integral is convergent , otherwise it is divergent.

Example: Examine convergence of

Soln.

Since is finite , so is convergent.

Example: Examine convergence of

Soln.

Since is not exist , so is divergent.