INFINITE SERIES LIMIT COMPARISON TEST

LIMIT COMPARISON TEST

Let be a series under investigation and let be a comparison series whose behavior is know. We are told that .

If the limit where c is a real number c > 0 then the two series either both converge or both diverge

LIMIT COMPARISON TEST EXCEPTIONAL CASE C = 0

Let be a series under investigation and let be a comparison series THAT CONVERGES. We are told that .

If the limit then converges.

LIMIT COMPARISON TEST EXCEPTIONAL CASE C = 0

Let be a series under investigation and let be a comparison series THAT DIVERGES. We are told that .

If the limit then diverges.

LIMIT COMPARISON TEST EXPCEPTIONAL CASE C = INFINITY

Let be a series under investigation and let be a comparison series THAT DIVERGES. We are told that .

If the limit then diverges.

1. ANTON PAGE 612

We have . We let .

We know that must converge by the p test

Evaluate

Since equals a finite positive number the series must match the behavior of the series .

Since converges, the series converges.

1. ANTON PAGE 612

We have . We let .

We know that must diverge by the p test

Evaluate

Since equals a finite positive number the series must match the behavior of the series .

Since diverges, the series diverges.

1. ANTON PAGE 612

We have . We let .

We know that must converge because it is a geometric series

with r =1/3 .

Evaluate

Since equals a finite positive number the series must match the behavior of the series .

Since converges, the series converges.

1. ANTON PAGE 612

We have . We let .

We know that must diverge because it is a harmonic series.

Evaluate

Since equals a finite positive number the series must match the behavior of the series .

Since diverges, the series diverges.

1. ANTON PAGE 612

We have . We let .

We know that must diverge by the p test.

Evaluate

Since equals a finite positive number the series must match the behavior of the series .

Since diverges, the series diverges.

1. ANTON PAGE 612

We have . We let .

We know that must converge by the p test.

Evaluate

Since equals a finite positive number the series must match the behavior of the series .

Since converges, the series converges.

1. ANTON PAGE 612

We have . We let .

We know that must converge by the p test.

Evaluate

Since equals a finite positive number the series must match the behavior of the series .

Since converges, the series converges.

1. ANTON PAGE 612

We have . We let .

We know that must diverge by the p test.

Evaluate

Since equals a finite positive number the series must match the behavior of the series .

Since diverges, the series diverges.

1. ANTON PAGE 612

We have . We let .

We know that must diverge by the p test.

Evaluate

Since equals a finite positive number the series must match the behavior of the series .

Since diverges, the series diverges.

1. ANTON PAGE 612

We have . We let .

We know that must diverge by the p test.

Evaluate

This is the exceptional case. Since goes to infinity, and diverges, we must have also diverges.

1. ANTON PAGE 612

We have . We let .

We know that must converge by the p test.

Evaluate

Since equals a finite positive number, then by the limit comparison test, the series must match the behavior of the series .

Since converges, the series converges.

1. ANTON PAGE 612

We have . We let .

We know that must converge by the p test.

Evaluate

Use LHospital’s rule:

This is the exceptional case c= 0. If and if converges, then also converges.

The series converges.

1. ANTON PAGE 612

We have . We let .

We know that must diverge by the p test.

Evaluate

Use LHospital’s rule:

Since diverges, the original series must also diverge by the limit comparison test.

diverges.