Section 9.4 Comparison Tests

is a geometric series. is not

is a p-series. is not

is easily integrated. is not

To check the convergence of an unknown series, compare it to a series you know.

**Direct Comparison Test (DCT)**

For series with positive terms, let for all n

If converges, then (something smaller) converges

If diverges, then (something larger) diverges

Examples: Does converge or diverge? Does converge or diverge?

Try:

**The limit comparison test**

Given two series and . Let’s compare the terms of each using limits.

* If , then ,

so if converges also converges. If diverges also diverges.

* If , then ,

so if converges also converges. If diverges also diverges.

The constant doesn’t change whether the series converges or diverges since it can be factored out.

* If , then ,

so if converges, the smaller also converges. If diverges, we don’t know about .

* If , then ,

so if diverges, the larger also diverges. If converges, we don’t know about .

**Limit Comparison Test (LCT)**

For series with positive terms,

If **a finite, nonzero constant**, then the series behave the same, both diverge

or both converge.

So what about ?

More Examples: converge or diverge?