

# The Extension

MATH 131: Calculus II, Sections 2 and 3

December 7, 2015

## THE RATIO TEST EXTENSION

It turns out that if we test for absolute convergence using the ratio test, we can tell more than just whether or not the series is absolutely convergent. If the ratio  $r$  is actually greater than 1, the series will diverge. We do not even need to check conditional convergence!

**The Ratio Test Extension:** Assume that  $\sum_{n=1}^{\infty} a_n$  is a series with non-zero terms and let  $r = \lim_{n \rightarrow \infty} \left| \frac{a_{n+1}}{a_n} \right|$ .

1. If  $r < 1$ , then the series  $\sum_{n=1}^{\infty} a_n$  converges absolutely.
2. If  $r > 1$  (including  $\infty$ ), then the series  $\sum_{n=1}^{\infty} a_n$  diverges.
3. If  $r = 1$ , then the test is inconclusive. The series may converge or diverge.