

Hint sheet for Exam 3

This hint sheet is meant to remind you about the convergence/divergence tests, and is not a step by step guide. This sheet will be available to you during the exam.

1. Known series:

- A geometric series converges when $|r| < 1$, and diverges if $|r| \geq 1$.
- The p -series converges if $p > 1$, and diverges if $p \leq 1$.
- The similarity of an unknown series to either a geometric series or a p -series is useful for the tests for convergence.

2. Convergence/Divergence tests:

- (a) Test for Divergence.
- (b) Special structure: Telescopic (not common, but is sometimes convenient).
- (c) Tests for positive series (or absolute convergence):
 - i. The Integral Test.
Use for positive decreasing terms that come from a function you can integrate.
 - ii. The Comparison Tests:
 - Direct Comparison Test.
Compare to a known positive series (geo or p -series, for example). Works best when one term is clearly larger/smaller.
 - Limit Comparison Test:
Use when direct comparison is awkward but a_n behaves like a simpler b_n .
 - iii. Root Test
 - iv. Ratio Test
NOTE: The results of the Ratio and Root tests are the same (in terms of the limit), and are similar to the results of the Geo series “test”.
- (d) Alternating Series Test (for conditional convergence)
For terms with $(-1)^n$ or $(-1)^{n+1}$. Check that the positive part decreases to 0.