**Math 280**

**Summary of Convergence Tests**

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| **Name** | **Statement** | **Comments** |
| **Divergence Test**  (11.2) | If  does not exist or if ,  then  diverges. | If , then  may or may not converge. |
| **Geometric Series**  (11.2) | is convergent if  and  its sum is .  If , the series is divergent. | You can always write out the first few terms to get the first term, *a* and the common ratio *r*. |
| **P-Series**  (11.3) | is convergent if  and divergent if . | is called the harmonic series, and diverges (*p* = 1) |
| **Integral Test**  (11.3) | If is a continuous, positive, decreasing function on such that . Then   1. If  is convergent, then is convergent. 2. If is divergent, then is divergent. | This test only applies to series with (eventually) positive terms  Try this test when  is easy to integrate. |
| **Comparison Test**  (11.4) | If and have positive terms  (i) If is convergent and for all, then is also  convergent.  (ii) If is divergent and for all, then is also  divergent. | This test only applies to series with positive terms  Try this test as a last resort; other tests are often easier to apply.  Compare to known series like geometric and p-series |
| **Limit Comparison Test**  (11.4) | Suppose and have positive terms  If  (where *c* is a finite number), then either both series converge or both diverge. | This is easier to apply than the comparison test.  When choosing a series for comparison, try the ratio of the leading terms from numerator and denominator. |
| **Alternating Series Test**  (11.5) | If the alternating series  where  satisfies  and  then the series converges. | This test applies only to alternating series.  Check that terms decrease by taking the derivative of the corresponding f(x). |

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| **Name** | **Statement** | **Comments** |
| **Absolute Convergence**  (11.6) | If  converges, thenconverges (absolutely). | If the series has some negative terms (or sines/cosines), take  and test for absolute convergence. |
| **Ratio Test**  (11.6) | Let be a series with non-zero terms and suppose     1. If L < 1, the seriesis absolutely convergent. 2. If L > 1 or , then the series  diverges. 3. If L = 1 , the test is inconclusive. The series may be   convergent or divergent. | The series does NOT have to have positive terms and does NOT have to be alternating.  Try this test on series with a mix of factorials (n!), nth powers (10n), and powers of n (n4)  Do not use with p-series or rational/root functions of n (will yield inconclusive results). |
| **Root Test**  (11.6) | Suppose   1. If L < 1, then the series  is absolutely convergent. 2. If L > 1 or , then the series  diverges . 3. If L = 1 , the test is inconclusive. The series may be   convergent or divergent. | Try this test if  has  the form , and involves nth powers. |