STRATEGY FOR DETERMINING THE CONVERGENCE OF SERIES

1. If it looks like the series terms do not converge to zero use the **Divergence Test**. (Only use if you can quickly check if \( \lim_{n \to \infty} a_n \neq 0 \))

2. **p-series** \( \left( \sum \frac{1}{n^p} \right) \) or geometric series \( \left( \sum_{n=1}^{\infty} ar^n \right) \)
   
P series will converge only if \( p > 1 \). Geometric series will converge only if \(|r| < 1|\).
   
Use algebra to get geometric series in right form.

3. If the series is similar to p-series or geometric series try the **Comparison Test**.
   **POSITIVE SERIES ONLY**

4a. If the inequality goes the wrong way in the **Comparison Test** or the series is a ratio of polynomials or algebraic functions try the **Limit Comparison Test**. Note: This is not the only case where **Limit Comparison** is useful. \( \sum \sin \left( \frac{1}{n} \right) \) diverges by Limit Comparison with the divergent harmonic series \( \sum \frac{1}{n} \).
   **POSITIVE SERIES ONLY**

4b. If \( c = 0 \) or \( c = \infty \) in the **Limit Comparison Test** try the **Extended Limit Comparison Test**. **POSITIVE SERIES ONLY**

5. If the series contains factorials or exponentials. Try the **Ratio Test**.

6. If the series is an alternating series try the **Alternating Series Test**.

7. If the series is a power series use the **Ratio Test** to determine the radius and interval of convergence. Test the endpoints of the interval separately.

8. If \( a_n = f(n) \) and \( f(x) \) is a positive decreasing function and \( \int_1^{\infty} f(x)dx \) can be evaluated try the **Integral Test**. **POSITIVE SERIES ONLY**

9. If the series is mixed terms then the series either converges absolutely or converges conditionally or diverges. Test for **Absolute Convergence** first. Because a test for absolute convergence is a test on a positive series try any of the above tests. If none work try the **Divergence Test**.