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. \( \text{p-series } \left( \sum \frac{1}{n^p} \right) \text{ or geometric series } \left( \sum_{n=1}^{\infty} ar^n \right) \)

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.