P-Series Test

 $\sum_{n=1}^{\infty} \frac{1}{x^p} \begin{cases} Diverge & x \le 1 \\ Converge & 1 > 1 \end{cases}$

By the integral test

Integral Test

 $\sum_{n=1}^{\infty} a_n$ converges if and only if $\int_1^{\infty} f(x) dx$ converges.

 $\sum_{n=1}^{\infty} a_n$ diverges if and only if $\int_1^{\infty} f(x) dx$ diverges.

Conditions for the Integral Test

I) Must be continous for all values of x II) Must be positive III) Must be decreasing

Direct Comparison Test

If B_n is a known series which converges and $A_n \le B_n$ then A_n must also converge

If B_n is a known series which diverges and then A_n must also diverge

Comparison Tests

Limit Comparison Test

 $\lim_{a=\infty} \frac{A_n}{B_n}$, Where B_n is a series with known behavior

If $\lim_{a=\infty} \frac{A_n}{B_n} \neq 0$, then B_n and A_n must either both converge or diverge If $\lim_{a=\infty} \frac{A_n}{B_n} = 0$ and B_n is a convergent series, then A_N must also converge If $\lim_{a=\infty} \frac{A_n}{B_n}$ diverges and B_n is a divergent series, then A_N must diverge

Converge/Diverge

 N^{th} test for divergnce (NTTFDO)

 $\lim_{n=\infty} a_n \neq 0$ then the series must diverge

$$\sum_{n=1}^{\infty} a_n = \lim_{a} \sum_{n=1}^{a}$$

Evaluate Exactly

Telescoping Series

$$\sum_{n=1}^{\infty} \frac{1}{n(n-1)}$$

A series where intermediate terms cancel, leaving a finite sum - Partial Fraction Decomposition

- Find Equation for S_n

- $\lim_{n\to\infty} S_n$

Geometric Series

$$\sum_{k=0}^{\infty} (r)^k = \frac{1}{1-r}, |r| < 1$$

$$\sum_{n=1}^{\infty} r^{N} = \frac{r^{N}}{1-r}, |r| < 1$$

A series which increases by the same amount for each value of N. Ie. $\frac{A_{n+1}}{A_n} = L, \text{ where L is a number}$ Note: This does not converge for values of r greater than 1