$\lim\limits_{n \to \infty} a_n$

1. exists $\Rightarrow$ sequence converges
2. DNE $\Rightarrow$ sequence diverges

Geometric Series: $\sum\limits_{n=1}^{\infty} ar^{n-1}$

1. $|r| < 1$: converges. $S_\infty = \dfrac{a}{1-r}$
2. $|r| \geq 1$: diverges.

p - Series: $\sum\limits_{n=1}^{\infty} \dfrac{1}{n^p}$

1. $p > 1$: converges.
2. $p \leq 1$: diverges.

Comparison Test
1. Bigger series converges $\Rightarrow$ smaller series converges.
2. Smaller series diverges $\Rightarrow$ bigger series diverges.

Ratio Test: $\lim\limits_{n \to \infty} \left| \dfrac{a_{n+1}}{a_n} \right| = L$

1. $L < 1$: converges.
2. $L > 1$: diverges.
3. $L = 1$: inconclusive.

Integral Test: $\int_1^\infty f(x)\, dx = \lim\limits_{N \to \infty} \int_1^N f(x)$

1. converges $\Rightarrow \sum\limits_{n=1}^{\infty} a_n$ converges.
2. diverges $\Rightarrow \sum\limits_{n=1}^{\infty} a_n$ diverges.

Test for Divergence: $\lim\limits_{n \to \infty} a_n$

1. DNE or $\neq 0 \Rightarrow \sum\limits_{n=1}^{\infty} a_n$ diverges.
2. $= 0 \overset{maybe}{\Rightarrow} \sum\limits_{n=1}^{\infty} a_n$ converges.

Root Test: $\lim\limits_{n \to \infty} \sqrt[n]{|a_n|} = L$

1. $L < 1$: converges.
2. $L > 1$: diverges.
3. $L = 1$: inconclusive.