NOTE: These tests prove convergence and divergence, not the actual limit L or sum **S**.

Sequence: $\lim_{n\to\infty} a_n = L$

$(a_n, a_{n+1}, a_{n+2}, \ldots)$

Series: $\sum_{n=1}^{\infty} a_n = \mathbf{S}$

$(a_n + a_{n+1} + a_{n+2} + \cdots)$

***<u>Sequences and Series</u>

1. If a sequence $\{a_n\}$ has a limit L, that is, $\lim_{n\to\infty} a_n = L$, then the sequence is said to <u>converge</u> to L. If there is no limit, the series <u>diverges</u>. If the sequence $\{a_n\}$ converges, then its limit is unique. Keep in mind that

   $\lim_{n\to\infty} \frac{\ln n}{n} = 0$; $\lim_{n\to\infty} x^{\left(\frac{1}{n}\right)} = 1$; $\lim_{n\to\infty} \sqrt[n]{n} = 1$; $\lim_{n\to\infty} \frac{x^n}{n!} = 0$. These limits are useful and arise frequently.

2. The harmonic series $\sum_{n=1}^{\infty} \frac{1}{n}$ diverges; the geometric series $\sum_{n=0}^{\infty} ar^n$ converges to $\frac{a}{1-r}$ if $|r| < 1$ and diverges if $|r| \ge 1$ and $a \ne 0$.

3. The p-series $\sum_{n=1}^{\infty} \frac{1}{n^p}$ converges if $p > 1$ and diverges if $p \le 1$.

Sequences & Series	
Sequence	$\lim_{n\to\infty} a_n = L$ (Limit) Example: $(a_n, a_{n+1}, a_{n+2}, \dots)$
Geometric Series	$S = \lim_{n\to\infty} \frac{a(1-r^n)}{1-r} = \frac{a}{1-r}$ only if $\lvert r \rvert < 1$ where r is the radius of convergence and $(-r, r)$ is the interval of convergence