Series Convergence Tests

Test	When To Use	Conclusions [1]
Geometric Series	$\sum_{k=0}^{\infty} ar^k$	Converges to $\frac{a}{1-r}$ if $\|r\| < 1$; diverges if $\|r\| \geq 1$.
k^{th} Term Test	All series	If $\lim_{k\to\infty} a_k \neq 0$, the series diverges.
Integral Test	Where $a_k = f(k)$ and f is continuous, decreasing, and $f(x) \geq 0$ for all x.	$\sum_{k=0}^{\infty} a_k$ and $\int_1^{\infty} f(x)\mathrm{d}x$ either *both* converge or *both* diverge.
p-series	$\sum_{k=0}^{\infty} \frac{1}{k^p}$	Converges for $p > 1$; diverges for $p \leq 1$.
Comparison Test	Where $0 \leq a_k \leq b_k$ for all k	If $\sum_{k=0}^{\infty} b_k$ converges, then $\sum_{k=0}^{\infty} a_k$ converges. If $\sum_{k=0}^{\infty} a_k$ diverges, then $\sum_{k=0}^{\infty} b_k$ diverges.
Limit Comparison Test	Where for all k: $a_k \geq 0$, $b_k \geq 0$ and $\lim_{k\to\infty} \frac{a_k}{b_k} = L > 0$	$\sum_{k=0}^{\infty} a_k$ and $\sum_{k=0}^{\infty} b_k$ either *both* converge or *both* diverge.
Alternating Series Test	$\sum_{k=0}^{\infty} (-1)^{k+1} a_k$ where $a_k > 0$ for all k	If $\lim_{k\to\infty} a_k = 0$ and $a_{k+1} \leq a_k$ for all k, then the series converges.
Absolute Convergence	Series with both positive and negative terms (including alternating series)	If $\sum_{k=1}^{\infty} \|a_k\|$ converges then $\sum_{k=1}^{\infty} a_k$ converges (absolutely).
Ratio Test	Any series (especially those involving exponentials and/or factorials)	For $\lim_{k\to\infty} \left\|\frac{a_{k+1}}{a_k}\right\| = L$, If $L < 1$, then $\sum_{k=1}^{\infty} a_k$ converges absolutely. If $L > 1$, then $\sum_{k=1}^{\infty} a_k$ diverges. If $L = 1$, then no conclusion can be drawn.
Root Test	Any series (especially those involving exponentials)	For $\lim_{k\to\infty} \sqrt[k]{\|a_k\|} = L$, If $L < 1$, then $\sum_{k=1}^{\infty} a_k$ converges absolutely. If $L > 1$, then $\sum_{k=1}^{\infty} a_k$ diverges. If $L = 1$, then no conclusion can be drawn.

[1] Be careful with your conclusions! For example, with the k^{th} Term Test, if $\lim_{k\to\infty} a_k = 0$, the series does *not necessarily* converge. For another example, consider the harmonic series. See also the sheet on Logical Operators.