Summary of the convergence tests that may appear on the AP Calculus BC exam.

Test Name	The series …	will converge if	Or will diverge if	Comments
***n*th –term test**	$\sum_{n=1}^{\infty} a_n$		$\lim_{n\to\infty} a_n \neq 0$	For divergence only; the converse is false.
Geometric series	$\sum_{n=1}^{\infty} ar^{n-1}$	$-1 < r < 1$	$r \leq -1$ or $r \geq 1$	Sum = $\frac{a}{1-r}$
Alternating series test	$\sum_{n=1}^{\infty} (-1)^{n-1} a_n$	$\lvert a_{n+1}\rvert < \lvert a_n\rvert$ and $\lim_{n\to\infty} a_n = 0$		Error bound $\lvert S_\infty - S_n\rvert < \lvert a_{n+1}\rvert$
Integral test	$\sum_{n=1}^{\infty} a_n$ and $a_n = f(n) \geq 0$	$\int_1^{\infty} f(x)\,dx$ converges	$\int_1^{\infty} f(x)\,dx$ diverges	*f* must be continuous, positive and decreasing.
***p*-series**	$\sum_{n=1}^{\infty} \frac{1}{n^p}$	$p > 1$	$p \leq 1$	
Direct comparison test	$\sum_{n=1}^{\infty} a_n$	$0 < a_n \leq b_n$ and $\sum_{n=1}^{\infty} b_n$ converges	$0 < b_n \leq a_n$ and $\sum_{n=1}^{\infty} b_n$ diverges	
Ratio test	$\sum_{n=1}^{\infty} a_n$	$\lim_{n\to\infty} \frac{\lvert a_{n+1}\rvert}{\lvert a_n\rvert} < 1$	$\lim_{n\to\infty} \frac{\lvert a_{n+1}\rvert}{\lvert a_n\rvert} > 1$	If $\lim_{n\to\infty} \frac{\lvert a_{n+1}\rvert}{\lvert a_n\rvert} = 1$ the ratio test cannot be used.

Other useful convergence tests that may be used.

Test Name	The series …	will converge if	Or will diverge if	Comments
Limit comparison test	$\sum_{n=1}^{\infty} a_n$	$a_n > 0, b_n > 0$ $\lim_{n\to\infty} \frac{a_n}{b_n} = L > 0$ and $\sum_{n=1}^{\infty} b_n$ converges	$a_n > 0, b_n > 0$ $\lim_{n\to\infty} \frac{a_n}{b_n} = L > 0$ and $\sum_{n=1}^{\infty} b_n$ diverges	
Root est	$\sum_{n=1}^{\infty} a_n$	$\lim_{n\to\infty} \sqrt[n]{a_n} < 1$	$\lim_{n\to\infty} \sqrt[n]{a_n} > 1$	The test cannot be used if $\lim_{n\to\infty} \sqrt[n]{a_n} = 1$