UCF
Calc II

– Series Tests

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The following 10 series tests are covered.

- ☐ Geometric
- ☐ Telescoping
- ☐ P-Series
- ☐ Divergence
- ☐ Integral
- ☐ Comparison
- ☐ Limit
- ☐ Alternating
- ☐ Ratio
- ☐ Root

Go to **T**he **P**urple **D**ance **I**n **C**andy **L**and **A**nd **R**un **R**agged.

1 Tests

Test	Requirements	Action	Conclusion
Geometric-Series	$\sum_{n=0}^{\infty} ar^n$	Find r	$\lvert r\rvert < 1 \therefore converges, \lvert r\rvert \geq 1 \therefore diverges$
Telescoping	$\sum_{n=1}^{\infty} (b_n - b_{n+1})$	Expand & find cancel pattern	Cancel & sum
P-Series	$\sum_{n=1}^{\infty} \frac{1}{n}^p$	Find p	$p > 1\ converge, 0 < p \leq 1\ diverge$
Divergence	$\sum_{n=1}^{\infty} a_n$	Find $\lim_{n\to\infty} a_n$	$if \lim \neq 0\ or\ DNE \therefore diverges$
Integral	$\sum_{n=1}^{\infty} a_n$	$Find \int a_n, a_n{}'$	$iff\ is\ continuous, decreasing, and\ positive$ $\sum_{n=1}^{\infty} a_n$ & $\int_N^{\infty} f(x)dx,\ both\ c\ or\ d$
Comparison	$\sum a_n$ & $\sum b_n, \{a_n \leq b_n\} \geq 0$	$Find\ suiting\ b_n$	$\sum b_n\ convergent \therefore \sum a_n\ convergent$ $\sum a_n\ divergent \therefore \sum b_n\ divergent$
Limit Comparison	$\sum a_n$ & $\sum b_n, \{a_n, b_n\} \geq 0$	$\lim_{n\to\infty} \frac{a_n}{b_n}$	$lim = L \neq 0\ both\ c$ & $d, = 0\ both\ c, = \infty\ both\ d$
Alternating-Series	$\sum_{n=1}^{\infty} (-1)^n b_n$	Find $\lim_{n\to\infty} b_n,\ b_n{}'$	$if \lim_{n\to\infty} = 0\ and\ b_n{}' < 0 \therefore\ converges$
Ratio	$\sum_{n=1}^{\infty} a_n$	$\rho = \lim_{n\to\infty} \left\lvert \frac{a_{n+1}}{a_n} \right\rvert$	$if\ 0 \leq \rho < 1 \therefore\ converges\ absolutely$ $\rho > 1\ or\ \rho = \infty \therefore\ diverges$ $\rho = 1 \therefore\ no\ info$
Root	$\sum_{n=1}^{\infty} a_n$	$\rho = \lim_{n\to\infty} \sqrt[n]{\lvert a_n\rvert}$	