You suspect that $\sum_{n=c}^{\infty} a_n$ **CONVERGES**

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Identify the type of series

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Geometric Series $\sum_{n=c}^{\infty} ar^n$	***p*-series** $\sum_{n=c}^{\infty} \frac{1}{n^p}$	**Telescoping Series** $\sum_{n=c}^{\infty} (a_n - a_{n+1})$	**Alternating Series** $\sum_{n=c}^{\infty} (-1)^n a_n$	**None of these**
Show that $\lvert r \rvert < 1$ $\text{Sum} = \frac{\text{first term}}{1-\text{common ratio}}$	Show that $p > 1$	Show that the partial sums converge $\lim_{n\to\infty} S_n$ exists	Show $\lim_{n\to\infty}[a_n] = 0$ Verify: "Alternating Series whose terms decrease in absolute value to zero." $\text{Remainder} \le \lvert\text{next term}\rvert$	

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"Behaves like" Test

Integral Test	****Ratio Test****	****Root Test****	**Direct Comparison Test**	**Limit Comparison Test**
Show that all are true: $f(n) = a_n$ is 1. Positive 2. Continuous 3. Decreasing 4. $\int_0^{\infty} f(x)$ converges *	Show that $\lim_{n\to\infty} \left\lvert \frac{a_{n+1}}{a_n} \right\rvert < 1$ If the limit is one, the test is inconclusive.	Show that $\lim_{n\to\infty} \sqrt[n]{\lvert a_n \rvert} < 1$ If the limit is one, the test is inconclusive	Write down a series $\sum_{n=k}^{\infty} b_n$ and demonstrate the following 1. $a_n, b_n > 0$ for all $n \ge k \ge c$ 2. $\sum_{n=k}^{\infty} b_n$ converges* 3. $a_n \le b_n$ for all $n \ge k$ *	Write down a series $\sum_{n=k}^{\infty} b_n$ and demonstrate: 1. $a_n, b_n > 0$ for all $n \ge k \ge c$ 2. $\sum_{n=k}^{\infty} b_n$ converges* 3. $\lim_{n\to\infty} \frac{a_n}{b_n} = L > 0$ * L must be finite and positive

*Must be demonstrated   ** Use these tests to determine the interval of convergence of a given power series.

$\lim_{n\to\infty} \sqrt[n]{c} = 1 \ (c > 0)$; $\lim_{n\to\infty} \left(1 + \frac{c}{n}\right)^n = e^c$; $\lim_{n\to\infty} \sqrt[n]{n} = 1$; $\lim_{n\to\infty} \sqrt[n]{n!} = \infty$; $\lim_{n\to\infty} \sqrt[n]{n^c} = 1$; **<u>Growth Order:</u>** $c < \ln(\ln(n)) < \ln(n) < [\ln(n)]^c < n^c < c^n < n! < n^n$

You suspect that $\sum_{n=c}^{\infty} a_n$ **DOES NOT CONVERGE**

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Test if $\lim_{n\to\infty} a_n \neq 0$

$\neq 0$ → $\sum_{n=c}^{\infty} a_n$ Does not converge. Done.

(Diverges if $\lim_{n\to\infty} a_n = c \neq 0$)

$= 0$ → Identify the type of series

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Geometric Series $\sum_{n=c}^{\infty} ar^n$	***p*-series** $\sum_{n=c}^{\infty} \frac{1}{n^p}$	**Telescoping Series** $\sum_{n=c}^{\infty} (a_n - a_{n+1})$	**Alternating Series** $\sum_{n=c}^{\infty} (-1)^n a_n$	**None of these**
Show that $\lvert r\rvert \geq 1$	Show that $p \leq 1$	Show that the partial sums do not converge $\lim_{n\to\infty} S_n = \pm\infty$ or DNE	Show that $\lim_{n\to\infty} [a_n] \neq 0$ or $\lim_{n\to\infty} [a_n] \to \infty$ or DNE	↓

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"Behaves like" Test

Integral Test	**Ratio Test**	**Root Test**	**Direct Comparison Test**	**Limit Comparison Test**
Show that $f(n) = a_n$ is 1. Positive 2. Continuous 3. Decreasing 4. $\int_0^{\infty} f(x)$ diverges *	Show that $\lim_{n\to\infty} \left\lvert \frac{a_{n+1}}{a_n} \right\rvert > 1$ If the limit is one, the test is inconclusive.	Show that $\lim_{n\to\infty} \sqrt[n]{\lvert a_n\rvert} > 1$ If the limit is one, the test is inconclusive	Write down a series $\sum_{n=k}^{\infty} b_n$ and demonstrate the following: 1. $a_n, b_n > 0$ for all $n \geq k \geq c$ 2. $\sum_{n=k}^{\infty} b_n$ divereges* 3. $b_n \leq a_n$ for all $n \geq k$ *	Write down a series $\sum_{n=k}^{\infty} b_n$ and demonstrate: 1. $a_n, b_n > 0$ for all $n \geq k \geq c$ 2. $\sum_{n=k}^{\infty} b_n$ Diverges* 3. $\lim_{n\to\infty} \frac{a_n}{b_n} = L > 0$ * L is finite and positive

* Must be demonstrated*

$\lim_{n\to\infty} \sqrt[n]{c} = 1 \ (c > 0)$; $\lim_{n\to\infty} \left(1 + \frac{c}{n}\right)^n = e^c$; $\lim_{n\to\infty} \sqrt[n]{n} = 1$; $\lim_{n\to\infty} \sqrt[n]{n!} = \infty$; $\lim_{n\to\infty} \sqrt[n]{n^c} = 1$; **Growth Order:** $c < \ln(\ln(n)) < \ln(n) < [\ln(n)]^c < n^c < c^n < n! < n^n$