

Calculus - The Reckoning

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Definition 1.1.1: The Geometric Series Test

Suppose you have a series

$$\sum_{n=1}^{\infty} a(r)^{n-1}$$

or any other series with a common ratio r and an initial a , involving a multiplication of that variate value r over the indexes of said infinite series $\sum a_n$. The series converges if:

$$r < 1$$

and diverges when:

$$r > 1$$

If the infinite series $\sum a_n$ converges the sum can be found with:

$$S = \frac{a}{1-r}$$

And the interval of converges can also be found if r is a variate quantity with the inequality $|r| < 1$. Using this method, the *endpoints* must be tested to see if the bounds are inclusive or exclusive.

Definition 1.1.2: Telescoping Series Test

Suppose you have a series $\sum a_n$ of the form

$$a_n = b_n - b_{n+1}$$

where

$$\begin{aligned} \sum a_n &= \sum_{n=1}^{\infty} b_n - b_{n+1} = (b_1 - b_2) + (b_2 - b_3) + (b_3 - b_4) + \dots \\ \implies S &= b_1 \therefore S_k = b_1 - b_{k+1} \end{aligned}$$

Definition 1.1.3: n^{th} term test

Suppose you have a series $\sum a_n$

$$L = \lim_{n \rightarrow \infty} a_n$$

$\sum a_n$ diverges if:

$$L \neq 0$$

Definition 1.1.4: The Integral Test