



Math for the people, by the people.

integral test

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Consider a sequence $(a_n) = \{a_0, a_1, a_2, a_3, \dots\}$ and given $M \in \mathbb{R}$ consider any monotonically nonincreasing function $f : [M, +\infty) \rightarrow \mathbb{R}$ which extends the sequence, i.e.

$$f(n) = a_n \quad \forall n \geq M$$

An example is

$$a_n = 2n \quad \rightarrow \quad f(x) = 2x$$

(the former being the sequence $\{0, 2, 4, 6, 8, \dots\}$ and the later the doubling function for any real number.

We are interested on finding out when the summation

$$\sum_{n=0}^{\infty} a_n$$

converges.

The integral test states the following.

The series

$$\sum_{n=0}^{\infty} a_n$$

converges if and only if the integral

$$\int_M^{\infty} f(x) \, dx$$

is finite.