

Worksheet: Does the series converge or diverge?

For each of the following 13 infinite series, state whether it converges or diverges. Justify your statement using the following tests (or known series):

- geometric series
- telescoping series
- p -series
- divergence test
- integral test
- comparison test
- limit comparison test

In many cases multiple tests can determine convergence or divergence.

A.
$$\sum_{n=1}^{\infty} \frac{1}{n2^n}$$

B.
$$\sum_{n=1}^{\infty} 2^n$$

C.
$$\sum_{n=1}^{\infty} \frac{n}{2^n}$$

D.
$$\sum_{n=2}^{\infty} \frac{1}{n(\ln n)^3}$$

E.
$$\sum_{n=1}^{\infty} \frac{n-4}{n^3+2n}$$

F.
$$\sum_{n=2}^{\infty} \frac{1+\cos(n)}{e^n}$$

$$\mathbf{G.} \quad \sum_{n=3}^{\infty} \frac{n^2}{\sqrt{n^3 - 1}}$$

$$\mathbf{H.} \quad \sum_{n=1}^{\infty} \frac{n^3}{(n^4 - 3)^2}$$

$$\mathbf{I.} \quad \sum_{n=1}^{\infty} (-1)^n 3^{-n/3}$$

$$\mathbf{J.} \quad \sum_{n=2}^{\infty} \frac{|\sin(n)|}{n}$$

$$\mathbf{K.} \quad \sum_{n=2}^{\infty} \frac{1}{n!}$$

$$\mathbf{L.} \quad \sum_{n=1}^{\infty} \frac{n}{n^2 + 1}$$

$$\mathbf{M.} \quad \sum_{n=2}^{\infty} \frac{1}{n^2 - 1}$$

Finally, an observation and a question. In every case above you could use a computer to find s_{1000} , the (partial) sum of the first thousand terms. In which could you find the exact sum of the series?