Worksheet: Convergence or divergence of series

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

- test for divergence
- geometric series
- telescoping series
- p-series
- 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.

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

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

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

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

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

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

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

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

Finally, some general questions:

(i) In which of the above series can you find the exact sum of the series?

(ii) In which of the above series could you use a computer to find s_{100}, the sum of the first 100 terms?