Worksheet: Series again

For each of the following 10 infinite series, state whether it *converges absolutely*, *converges conditionally*, or *diverges*. If a parameter appears (e.g. "x" or "r") then give the answer for all cases of that parameter. Justify your statement using the following tests and categories:

- test for divergence
- geometric series
- integral test
- p-series
- comparison test
- limit comparison test
- alternating series test
- ratio test
- root test

Show appropriate work when applying a test. Multiple tests may apply; focus on successfully applying the easiest test that does the job.

A.

$$\sum_{n=0}^{\infty} \frac{1}{n!}$$

B.

$$\sum_{n=1}^{\infty} x^n$$

C.

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

D.

$$\sum_{n=1}^{\infty} \left(\frac{n}{-3} \right)^n$$

E.

$$\sum_{n=7}^{\infty} \frac{(-1)^n \ln n}{n}$$

F.

$$\sum_{n=1}^{\infty} \frac{n}{3^n + 5}$$

G.

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

H.

$$\sum_{k=1}^{\infty} \frac{r^k}{k!}$$

I.

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

J.

$$\sum_{n=0}^{\infty} \frac{(-3)^n}{(2n+1)!}$$