Series — Ratio test

Name: _____ Date: _____

Does each series converge? Use the ratio test: $L = \lim |a_{n+1} \div a_n|$.

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

$$\frac{a_{n+1}}{a_n} = \frac{(n+1)!}{2^{n+1}} \cdot \frac{2^n}{n!}$$

$$= \frac{n+1}{2}$$

$$L = \lim_{n \to \infty} \frac{n+1}{2} = \infty$$

$L > 1$, so the series diverges

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

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

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

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

6. $\sum_{n=1}^{\infty} \frac{4^n}{n!}$

Series · Ratio test — Answer key

1. $\infty\sum n = 1\frac{n!}{2^n}$ → diverges
2. $\infty\sum n = 1\frac{3^n}{n^2}$ → diverges
3. $\infty\sum n = 1\frac{n}{3^n}$ → converges
4. $\infty\sum n = 1\frac{n^2}{2^n}$ → converges
5. $\infty\sum n = 1\frac{2^n}{n}$ → diverges
6. $\infty\sum n = 1\frac{4^n}{n!}$ → converges