

§11.2 Practice Problems

True/False. Justify your answer or give a counterexample.

1. If $\sum a_n$ diverges, then a_n must approach infinity.
2. If $\lim_{n \rightarrow \infty} a_n = 0$, then $\sum a_n$ converges.
3. If $|r| < 1$, the geometric series $\sum_{n=1}^{\infty} ar^n$ converges to $\frac{a}{1-r}$.

Determine if the series converges or diverges. If it converges, find the limit.

1. $\sum_{n=1}^{\infty} \frac{1}{n(n+2)}$
2. $\sum_{n=0}^{\infty} \left(-\frac{1}{2}\right)^n$
3. $\sum_{n=1}^{\infty} \frac{n^2}{4n^2+1}$
4. $\sum_{n=1}^{\infty} \frac{5}{2^n}$
5. $\sum_{n=1}^{\infty} \left(\frac{2}{n(n+1)} + \frac{1}{3^n}\right)$
6. $\sum_{n=1}^{\infty} (-1)^n \frac{n}{n+1}$
7. $\sum_{n=0}^{\infty} 3 \left(\frac{1}{3}\right)^n$
8. $\sum_{n=1}^{\infty} \left(\frac{2^n - 1}{3^n}\right)$