Worksheet

Sequences & Geometric and Telescoping Series

Sequences

Determine whether each of the following sequences converges or diverges. If it converges, determine the limit to which it converges. If it diverges, determine whether it diverges to infinity, diverges to minus infinity, diverges because it oscillates, or diverges in some other fashion.

1. \[ \left\{ \frac{1-n-3n^2}{2n^2-1} \right\} \]
2. \[ \left\{ \frac{1+(-1)^n}{n^2+1} \right\} \]
3. \[ \left\{ (1+n)^n \right\} \]

4. \[ \left\{ (1+n)^{\frac{1}{n}} \right\} \]
5. \[ \left\{ \frac{n!}{(n+2)!} \right\} \]
6. \[ \left\{ \frac{1-3n+2n^3}{5+n^2} \right\} \]

7. \[ \left\{ \sqrt{n^2-4n-n} \right\} \]
8. \[ \left\{ \frac{\ln n^2}{n} \right\} \]
9. \[ \left\{ \left( -\frac{3}{4} \right)^n \right\} \]

Geometric and Telescoping Series

Determine whether each of the following series is a geometric series, a telescoping series or some other kind of series. If it is a geometric series, determine whether it converges or not. If it converges, find its sum. If it is a telescoping series, determine whether it converges or not. If it converges, find its sum.

1. \[ \sum_{k=0}^{\infty} \left( -\frac{3}{4} \right)^k \]
2. \[ \sum_{k=3}^{\infty} \left( \frac{2}{5} \right)^k \]
3. \[ \sum_{k=1}^{\infty} \frac{5}{3^k} \]

4. \[ \sum_{k=1}^{\infty} \left( \frac{5}{3} \right)^k \]
5. \[ \sum_{k=2}^{\infty} \frac{3^k}{4^{k+2}} \]
6. \[ \sum_{k=1}^{\infty} \frac{1}{(k+1)^2} \]

7. \[ \sum_{k=1}^{\infty} \frac{k}{k+1} \]
8. \[ \sum_{k=1}^{\infty} \frac{k}{(k+1)!} \]
9. \[ \sum_{k=0}^{\infty} x^k \]