

1. 10 pts. each Find the limit of the sequence, or explain why the limit does not exist.

(a) $\left\{ \frac{5n^8}{\sqrt{36n^{16} - 10n^{10}}} \right\}$

(b) $a_n = (-1)^n \sqrt[n]{n}$

2. 10 pts. Evaluate the geometric series, if it converges: $\sum_{k=2}^{\infty} \frac{3}{(-2)^k}$.

3. 10 pts. For the telescoping series

$$\sum_{k=1}^{\infty} \frac{1}{(k+1)(k+2)},$$

find a formula for the n th term of the sequence of partial sums $\{s_n\}$, then evaluate $\lim_{n \rightarrow \infty} s_n$ to obtain the value of the series.

4. 10 pts. each Determine whether the series converges or diverges using one of the indicated tests.

(a) $\sum_{k=1}^{\infty} \frac{k}{\sqrt{k^2 + 25}}$, Divergence or Integral Test

(b) $\sum_{k=1}^{\infty} k e^{-2k^2}$, Divergence or Integral Test

(c) $\sum_{k=1}^{\infty} \frac{(k!)^2}{(2k)!}$, Ratio Test

(d) $\sum_{k=1}^{\infty} \frac{k^2}{2^k}$, Root Test

(e) $\sum_{k=1}^{\infty} \frac{\sin^2 k}{k\sqrt{k}}$, either comparison test

(f) $\sum_{k=1}^{\infty} \frac{k^7}{k^9 + 3}$, either comparison test

5. 10 pts. each Use the Alternating Series Test to show the series converges, or use another test to show it diverges.

(a) $\sum_{k=2}^{\infty} \frac{(-1)^k}{k \ln^2 k}$

(b) $\sum_{k=1}^{\infty} (-1)^k \left(1 - \frac{2}{k} \right)$