

Do the following sequences converge or diverge?

If the sequence converges, find the limit.

1. $\{c_k\}_{k=1}^{\infty}$ where $c_k = (-1)^k$

2. $\left\{1 - \frac{1}{j}\right\}_{j=1}^{\infty}$

3. $\left\{\frac{5k^2 - 42}{3k^2 + 5}\right\}_{k=1}^{\infty}$

4. $\left\{\frac{\sin k}{k^2}\right\}_{k=1}^{\infty}$

5. $\{n^{1/n}\}_{n=1}^{\infty}$