

For the following determine whether the series converges or diverges using either the direct comparison test or limit comparison test.

1.
$$\sum_{k=1}^{\infty} \frac{(2k-1)(k^2-1)}{(k+1)(k^2+4)^2}$$

2.
$$\sum_{k=1}^{\infty} \frac{1 + \cos k}{e^k}$$

3.
$$\sum_{k=1}^{\infty} \frac{k^2 + k + 1}{k^4 + k^2}$$

4.
$$\sum_{k=1}^{\infty} \frac{e^{1/k}}{k}$$

5.
$$\sum_{k=1}^{\infty} \frac{k + 3^k}{k + 2^k}$$

6.
$$\sum_{k=1}^{\infty} \sin\left(\frac{1}{k^2}\right)$$

7.
$$\sum_{k=1}^{\infty} \frac{(k+1)\sqrt{k}}{(3k-10)^2\sqrt{k+2}}$$

8.
$$\sum_{k=1}^{\infty} \frac{1}{k^{1+1/k}}$$

9.
$$\sum_{k=1}^{\infty} \frac{\ln k^2}{k}$$

10.
$$\sum_{k=1}^{\infty} \frac{\ln k}{k^{3/2}}$$

11.
$$\sum_{k=1}^{\infty} \frac{2\sqrt{k+3}}{k+4}$$

12.
$$\sum_{k=1}^{\infty} \frac{5^k + k^2}{3^k + k!}$$