

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

1.
$$\sum_{k=1}^{\infty} \frac{9^k}{3 + 10^k}$$

2.
$$\sum_{k=1}^{\infty} \frac{1}{k^3 + 8}$$

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

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

5.
$$\sum_{k=1}^{\infty} \frac{6^k}{5^k - 1}$$

6.
$$\sum_{k=1}^{\infty} \frac{1}{\sqrt[3]{3k^4 + 1}}$$

7.
$$\sum_{k=1}^{\infty} \frac{1}{k!}$$

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

9.
$$\sum_{k=1}^{\infty} \frac{\sin^2 k}{k^2 + 3}$$

10.
$$\sum_{k=1}^{\infty} \frac{1 - \sin^2 k}{\sqrt{k}}$$

11.
$$\sum_{k=1}^{\infty} \left(\frac{1}{k^2} + 1 \right)^2$$

12.
$$\sum_{k=1}^{\infty} \frac{e^{-k}}{k + 4\sqrt{k}}$$