

For the following use the alternating series test or the divergence test to show if the sequence converges or diverges.

1. 
$$\sum_{k=1}^{\infty} (-1)^{k+1} \arctan(k)$$

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

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

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

5. 
$$\sum_{k=1}^{\infty} (-1)^k \frac{k^k}{k!}$$

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

7. 
$$\sum_{k=1}^{\infty} \left(\frac{-2}{k}\right)^{3k}$$

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

9. 
$$\sum_{k=1}^{\infty} (-1)^k \frac{k-1}{k}$$

10. 
$$\sum_{k=1}^{\infty} (-1)^k \frac{(2k)!}{k!}$$

11. 
$$\sum_{k=1}^{\infty} \cos\left(\frac{k\pi}{2}\right) \frac{1}{k+3}$$

12. 
$$\sum_{k=1}^{\infty} \sin\left(\left(k + \frac{1}{2}\right)\pi\right) (\ln(k+1) - \ln(k))$$