Worksheet: Strategy for Testing Series

Determine if the series converges or diverges. If it converges, indicate if the convergence is conditional or absolute.

1. $\displaystyle\sum_{n=1}^{\infty}(-1)^{n+1}\sin\left(\frac{\pi}{n}\right)$

2. $\displaystyle\sum_{n=1}^{\infty}(-1)^{n+1}\cos\left(\frac{\pi}{n}\right)$

3. $\displaystyle\sum_{n=1}^{\infty}\frac{\sin\left(\frac{\pi}{2}n\right)}{n}$

4. $\displaystyle\sum_{n=1}^{\infty}(-1)^{n+1}\frac{2^{3n+1}}{3^{2n}+1}$

5. $\displaystyle\sum_{n=1}^{\infty}\frac{(\arctan n)^n+1}{2^n}$

6. $\displaystyle\sum_{n=2}^{\infty}\ln\left(\frac{n^2}{n^2-1}\right)$

7. $\displaystyle\sum_{n=2}^{\infty}\frac{(\ln n)^{n-1}}{n^n}$

8. $\displaystyle\sum_{n=1}^{\infty}\frac{n\ln n}{(n+1)^3}$

9. $\displaystyle\sum_{n=1}^{\infty}(\sqrt[n]{3}-1)^n$

10. $\displaystyle\sum_{n=1}^{\infty}(-1)^n(\sqrt[n]{3}-1)$ (HARD)

11. $\displaystyle\sum_{n=1}^{\infty}\left(\frac{3n}{3n+1}\right)^{n^2}$

12. $\displaystyle\sum_{n=1}^{\infty}\left(1-\frac{1}{\sqrt[3]{n}}\right)^n$ (CHALLENGING)

13. $\displaystyle\sum_{n=1}^{\infty}\left[\ln\left(\frac{en}{n+1}\right)\right]^n$

14. $\displaystyle\sum_{n=2}^{\infty}\frac{n^{\ln n}}{(\ln n)^n}$ (HARD)

15. $\displaystyle\sum_{n=1}^{\infty}n^{-2}e^{\frac{1}{n}}$

16. $\displaystyle\sum_{n=1}^{\infty}\frac{n+9^n}{e^{n^2+1}}$

17. $\displaystyle\sum_{n=1}^{\infty}\frac{n^n}{n!}$

18. $\displaystyle\sum_{n=1}^{\infty}\frac{n^n}{(2n)!}$

19. $\displaystyle\sum_{n=1}^{\infty}\frac{n^{2n}}{(2n)!}$