

## Supplementary Homework Exercises for Section 11.4: Alternating Series

### Exercises

Answer each of the following questions.

S1. Determine whether each of the following series is convergent or divergent. You need to show sufficient justification and you can use any of our current tests for convergence.

(a)  $\sum_{n=1}^{\infty} \frac{(-1)^{n-1}}{2n+1}$

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

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

(d)  $\sum_{n=1}^{\infty} (-1)^{n-1} \frac{\ln n}{n}$

(e)  $\sum_{n=1}^{\infty} \frac{\cos n\pi}{n^{3/4}}$

(f)  $\frac{4}{7} - \frac{4}{8} + \frac{4}{9} - \frac{4}{10} + \frac{4}{11} - \cdots$

(g)  $\frac{1}{\sqrt{2}} - \frac{1}{\sqrt{3}} + \frac{1}{\sqrt{4}} - \frac{1}{\sqrt{5}} + \frac{1}{\sqrt{6}} - \cdots$

S2. Provide an example of a pair of series of positive terms  $\sum a_n$  such that  $\sum (-1)^n a_n$  converges, but  $\sum a_n$  diverges.

S3. Determine for which values of  $p$  the following series is convergent.

$$\sum_{n=1}^{\infty} \frac{(-1)^{n-1}}{n^p}$$