Section 9.6: Alternating Series

Warm-Up

Problem 1 *Suppose* $\sum_{k=1}^{\infty} a_k$ *is an infinite series.*

A. *Explain what it means for a series* $\sum_{k=1}^{\infty} a_k$ *to converge absolutely.*

B. *Explain what it means for a series* $\sum_{k=1}^{\infty} a_k$ *to converge conditionally.*

Problem 2 *Understanding what an alternating series is.*

A. *Is the series* $\sum_{k=1}^{\infty} \sin(k)$ *alternating?*

B. *Suppose* $\{a_k\}$ *is a sequence. Is the series* $\sum_{k=1}^{\infty} a_k$ *alternating? If it is not, what assumption(s) would be needed on the terms in the sequence* $\{a_k\}$ *to ensure the series is alternating?*

Group Work

Problem 3 *Determine if the following series absolutely converge, conditionally converge, or diverge.*

(a) $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n}{n+3}$

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

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

(d) $\displaystyle\sum_{n=0}^{\infty}\frac{(-1)^n\cdot 5}{3^n+3^{-n}}$

(e) $\displaystyle\sum_{n=4}^{\infty}\frac{(-2)^n}{n}$

(f) $\displaystyle\sum_{n=0}^{\infty}\frac{n^2+2n+1}{3n^4+1}$

(g) $\displaystyle\sum_{n=1}^{\infty}\left[\left(1+\frac{1}{n}\right)^2 e^{-n}\right]$

Problem 4 (a) *Find an upper bound for how close* $\displaystyle\sum_{k=0}^{4}\frac{(-1)^k k}{4^k}$ *is to the value of* $\displaystyle\sum_{k=0}^{\infty}\frac{(-1)^k k}{4^k}$.

(b) *(Calculator Recommended) How many terms are needed to estimate* $\displaystyle\sum_{n=1}^{\infty}\frac{(-1)^n\ln n}{n!}$ *to within* 10^{-6}*?*
