

Calculus (II) — Homework 4 (Fall 2026)

1. Determine whether the series converges or diverges. If it converges, find the sum of the series. If it diverges, explain why.

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

(c) $\sum_{k=0}^{\infty} \frac{3^{k-1}}{4^{3k+1}}.$

(b) $\sum_{k=0}^{\infty} \frac{(-1)^k}{5^k}.$

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

2. Determine whether the series converges or diverges. Explain why.

(a) $\sum_{k=2}^{\infty} \frac{k}{k^3 - k}.$

(e) $\sum_{k=1}^{\infty} k^2 2^{-k^3}.$

(i) $\sum_{k=1}^{\infty} \frac{k^2}{e^k}.$

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

(f) $\sum_{k=1}^{\infty} \frac{2 + \cos k}{\sqrt{k+1}}.$

(j) $\sum_{k=1}^{\infty} \frac{k^k}{3^{k^2}}.$

(c) $\sum_{k=1}^{\infty} \frac{\ln k}{k^2}.$

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

(k) $\sum_{k=1}^{\infty} \frac{2 \cdot 4 \cdots 2k}{(2k)!}.$

(d) $\sum_{k=1}^{\infty} \frac{1}{1 + 2 \ln k}.$

(h) $\sum_{k=1}^{\infty} \frac{1}{k 2^k}.$

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

3. Does the series converge absolutely, converge conditionally, or diverge? Explain your reasoning.

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

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

(e) $\sum_{k=1}^{\infty} (-1)^k k \sin(1/k).$

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

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

(f) $\sum_{k=1}^{\infty} \frac{\sin(\pi k/2)}{k \sqrt{k}}.$