

Show all work to receive full credit.

1. In each case, answer CONVERGES, DIVERGES, or INCONCLUSIVE.

(a) If a_n are nonnegative, decreasing to 0, then $\sum a_n \dots$

(b) If $0 \leq a_n \leq \frac{1}{n}$, then $\sum a_n \dots$

(c) If $0 \leq a_n \leq \frac{1}{n^3}$, then $\sum a_n \dots$

(d) If $\lim_{n \rightarrow \infty} \left| \frac{a_{n+1}}{a_n} \right| > 1$, then $\sum a_n \dots$

2. State whether the following series converges or diverges. You do not need to show work.

(a) $\sum \frac{n^2}{2^n}$

(b) $\sum \frac{\ln n}{n}$

(c) $\sum \frac{n!}{100^n}$

(d) $\sum \frac{(-1)^n}{n^2 + 1}$

(e) $\sum \frac{(-1)^n}{\sqrt{n^2 + 1}}$

(f) $\sum_{n=1}^{\infty} \cos(2n\pi)$

3. Sum the series $\sum \frac{4 + (-3)^n}{5^{n+1}}$ or show that it diverges. Display your work carefully and completely.

4. Compute $\int_2^\infty \frac{2}{x(\ln x)^3} dx$.

5. Determine whether each series diverges, converges absolutely, or converges conditionally. Support your answer with a clear argument based on our tests.

(a) $\sum \frac{n^2(-2)^n}{n!}$

(b) $\sum \frac{(-1)^n}{3n+1}$

(c) $\sum \left(\frac{-3}{n}\right)^n$