

Problem 1. Consider the region bounded by the graphs of $y = x$, $y = 2 - x$, and the x -axis. Rotate this region around the x -axis. What is its volume?

Problem 2. Is the following series convergent or divergent? How do you know?

(a) $\sum_{n=1}^{\infty} \frac{1}{n^2 + 5n + 4}$

(b) $\sum_{n=1}^{\infty} n^{-n-1/n}$

Problem 3. True or false? If false, give a counterexample.

(a) If $\lim_{n \rightarrow \infty} a_n = 0$, then $\sum_{n=1}^{\infty} a_n$ converges.

(b) If $\lim_{n \rightarrow \infty} a_n \neq 0$, then $\sum_{n=1}^{\infty} a_n$ diverges.

(c) If $\sum_{n=1}^{\infty} |a_n|$ converges, then $\sum_{n=1}^{\infty} a_n$ converges.

(d) If $\sum_{n=1}^{\infty} 2^n a_n$ converges, then $\sum_{n=1}^{\infty} (-2)^n a_n$ converges.