1. If we want to approximate
$$\sum_{n=0}^{\infty} \frac{(-1)^n}{n^3}$$
by a partial sum, how many terms are needed to get an error below 10^{-6}?

2. Label each of the following as "absolutely convergent," "conditionally convergent but not absolutely convergent," or "divergent." (All sums are from $n = 1$ to ∞.)

   (a) $\sum (-1)^n$
   (b) $\sum (-1)^n / n$
   (c) $\sum (-1)^n / (n^2 + n)$
   (d) $\sum (-1)^n / \ln(n)$
   (e) $\sum (-1)^n e^{-n}$

3. Consider the series

$$\sum_{n=1}^{\infty} (-1)^n \sin\left(\frac{1}{n}\right)$$

A classmate makes the argument that the series converges: "This is an alternating series, and the terms of that sequence converge to 0. Thus, by the alternating series test, the series converges."

You write a program to find the first 50 terms of the series, and the series appears to converge. Yet, when you make this argument to your TA, they stop, think for a moment, and say the following:

"The series does converge. However..."

What's the last part of the thing they say?