Calculus Section 9.5 Alternating Series Test.

-Name:

Most of the tests that we've used so far have dealt with only positive terms (geometric test withstanding). A series whose terms switch between positive and negative is called an **alternating series**. An alternating series cannot have two terms of the same sign back-to-back.

Alternating Series Test

Let $a_n > 0$. The alternating series:

$$\sum_{n=1}^{\infty} (-1)^n a_n$$
 and $\sum_{n=1}^{\infty} (-1)^{n+1} a_n$

will converge if the following two conditions are met:

1) $\lim a_n = 0$ and 2) $a_{n+1} \le a_n$ for all n

If the test fails the first condition, then the series diverges by the nth term test.

Example) Using the Alternating Series Test

Determine the convergence or divergence of $\sum_{n=1}^{\infty} (-1)^{n+1} \frac{1}{n}$

Example) Use the Alternating Series Test

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

$$2)\sum_{n=1}^{\infty}\frac{1}{n^2}\cos\left(\pi x\right)$$

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