Infinite Series

Alternating Series Test

→ When do you use it?

→ How do you use it?

Use Alternating series test for

$$\sum_{n=0}^{\infty} (-1)^n a_n$$

If a_n is decreasing

Converges: $\lim_{n\to\infty} a_n = 0$

diverges: not this test. (Use divergence test)

Infinite Series

Use the Alternating Series Test to determine if

A) $\sum_{n=0}^{\infty} \frac{(-1)^{n+1}}{n}$

B) $\sum_{n=0}^{\infty} \frac{(-1)^n(2n+1)}{n+1}$

converges or diverges.

A) $\sum_{n=0}^{\infty} \frac{(-1)^{n+1}}{n}$ $\quad \frac{1}{n}$ is decreasing

$$\lim_{n\to\infty} \frac{1}{n} = 0$$

∴ Converges by Alternating series test

B) $\sum_{n=0}^{\infty} \frac{(-1)^n(2n+1)}{n+1}$ let n=even $\lim_{n\to\infty} \frac{2n+1}{n+1} = 2$

let n=odd $\lim_{n\to\infty} -\frac{(2n+1)}{n+1} = -2$

$\lim_{n\to\infty} \frac{(-1)^n(2n+1)}{n+1}$ = does not exist so diverges by divergence test.

Infinite Series

Ratio Test

→ When do you use it?

→ How do you use it?

Can use this one for

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

→ this one test tells you if both pos & negative series converge or diverge.

Find

$$R = \lim_{n\to\infty} \left| \frac{a_{n+1}}{a_n} \right|$$

If

$r < 1$: converges

$r > 1$: diverges

$r = 1$: Inconclusive

Infinite Series

Use the Ratio test to determine if $\sum_{n=1}^{\infty} \frac{1}{n!}$ Converges or diverges

$\sum_{n=1}^{\infty} \frac{1}{n!}$

$R = \lim_{n\to\infty} \frac{1}{(n+1)!} \cdot \frac{n!}{1} = \lim_{n\to\infty} \frac{\cancel{n!}}{(n+1)\cancel{n!}}$

$= \lim_{n\to\infty} \frac{1}{n+1} = 0 < 1$

$\therefore$ Converges by Ratio test $r = 0 < 1$.