

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

Summation, from 1 to infinity, all terms, minus 1 to the  $n$ -th power times  $n$  plus 1 over  $2n$  minus 1.

$$I \quad a_n = \frac{n+1}{2n-1}$$

I notice that it's an alternating series, so I will consider  $a_n$  to be only  $n$  plus 1 over  $2n$  minus 1 (without the  $(-1)^n$  part).

We need to perform alternating series test.

1°  $a_n > 0$   $\frac{n+1}{2n-1} > 0$ ,  $n \in \mathbb{N}$  is  $a_n$  greater than 0 for all  $n \geq 1$ .  
True, because  $n$  assumes <sup>only</sup> values  $\geq 1$ !

2°  $\{a_n\}$  the second condition is  $a_n$  a decreasing sequence. It is easy to see that  $a_n$  decreasing, because  $2n$  minus 1 grows faster, than  $n$  plus 1.

3°  $\lim_{n \rightarrow \infty} a_n = 0$  in the third condition we need to check

if the limit of  $a_n$  series is zero.

$$\lim_{n \rightarrow \infty} \frac{n+1}{2n-1} = \lim_{n \rightarrow \infty} \frac{n(1+\frac{1}{n})}{2n(1-\frac{1}{2n})} = \frac{1}{2}$$

the series DIVERGES, because the third condition is not met.