

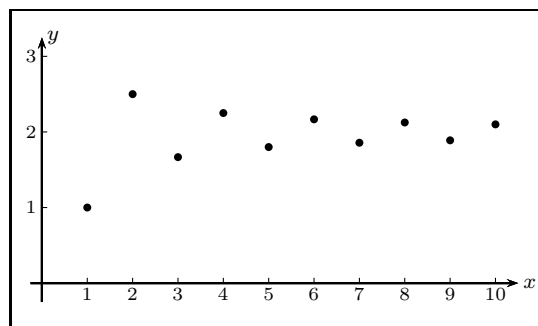
Calculus II, Section 11.1, #20
Sequences

Calculate, to four decimal places, the first ten terms of the sequence and use them to plot the graph of the sequence by hand. Does the sequence appear to have a limit? If so, calculate it. If not, explain why.¹

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

The calculated values are shown in the table at left, and are graphed on the right.

n	a_n
1	1.0000
2	2.5000
3	1.6667
4	2.2500
5	1.8000
6	2.1667
7	1.8571
8	2.1250
9	1.8889
10	2.1000



From the graph, it appears that the sequence has a limit of 2.

We calculate

$$\begin{aligned} & \lim_{n \rightarrow \infty} \left(2 + \frac{(-1)^n}{n} \right) \\ &= \lim_{n \rightarrow \infty} 2 + \lim_{n \rightarrow \infty} \frac{(-1)^n}{n} \end{aligned}$$

Since $\lim_{n \rightarrow \infty} \frac{1}{n} = 0$ and if $\lim_{n \rightarrow \infty} |a_n| = 0$, then $\lim_{n \rightarrow \infty} a_n = 0$, we have

$$\begin{aligned} &= 2 + 0 \\ &= 2 \end{aligned}$$

¹Stewart, *Calculus, Early Transcendentals*, p. 704, #20.