Excel Tool: Partial Sums of Series

In this spreadsheet, we learn how to compute the values of the partial sums of an infinite series.

We will describe everything in this demonstration within the context of one example infinite series:

$$\sum_{n=0}^{\infty} \left( \frac{2}{3} \right)^n.$$ 

We begin by creating three column headings, labeled as shown, in our Excel spreadsheet. Our spreadsheet now looks like this:

The first column will track the value of \( n \), the second column will track the value of \( a_n \), and the third column will track the partial sum of the preceding \( a_n \)'s.

Next, we enter the values of \( n \) to be used. The easiest way to do this is to enter a 0 in the cell immediately below the one labeled “n” (i.e. cell B6 in our example spreadsheet), then enter a 1 in the cell below it. (If our series started at some \( n \)-value other than 0, we would have started with that value in cell B6, instead.) After doing this, our spreadsheet looks like this:
Now, select both the 0 and the 1, then drag the highlight box down the column, as far as you want your solution sequence to go. If we choose to go to 10, our spreadsheet will look like this:
Now, the \( a_n \) column: Begin by entering the formula for the series terms, in cell C6. Specifically, we type

\[ (2/3)^{B6} \]

where, as usual in Excel, we have replaced \( n \) with its cell address, B6. Now, we highlight and drag that cell to extend it to the rest of the cells in the \( a_n \) column. Our spreadsheet now looks like this:

Now, the \( s_n \) column: We start this column by entering the initial value of \( s_n \), which is simply the value of the first \( a_n \) (which is \( a_0 \) for us). Specifically, we type the following into cell D6:

\[ =C6 \]

Here’s what we get:
Next, we enter a formula that takes the previous entry in the \( s_n \) column, and adds the current value of \( a_n \) to it. So, for cell D7, we enter the formula

\[
=D6 + C7
\]

Then, highlight D7 and drag it down to the end of the table, to get this result:
Extending the Table:

If we want to extend our table to larger values of \( n \), all we must do is highlight the bottom row of the current table, and drag it down, as far as we want. For example, if we wanted to extend our example table to \( n = 20 \), we select the \( n = 10 \) row, and drag down ten cells, to get this: