Summing Up Geometric Series

Student Activity

Name _____

Class _____

Problem 1 – Infinite Series

1. Find the next three terms of each infinite series.

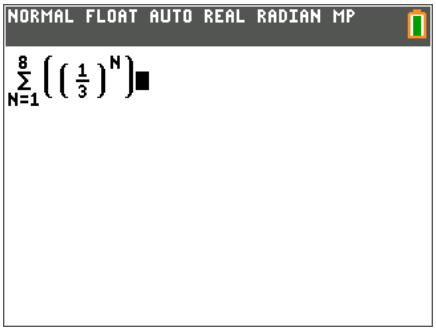
a. $\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+\ldots$ **b.** $\frac{1}{2}+\frac{2}{3}+\frac{3}{4}+\ldots$ **c.** $2+\frac{3}{2}+\frac{9}{8}+\ldots$

Hint: Divide each of the terms by the first term. What do you notice?

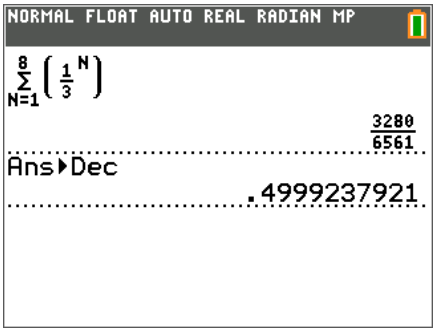
2. Write an expression in terms of *n* that describes each of the above series using sigma notation.

Problem 2 – Finding the Sum of a Geometric Series

Find the partial sum of these geometric series. To find the sum of a series, press alpha [f2] 2 for summation. Use the arrow keys to maneuver. Notice that you need to type another set of parentheses within the parentheses that are supplied. To show the decimal, press math 2 enter.



3a. $\sum_{n=1}^{8}\left(\frac{1}{3}\right)^{n}=$



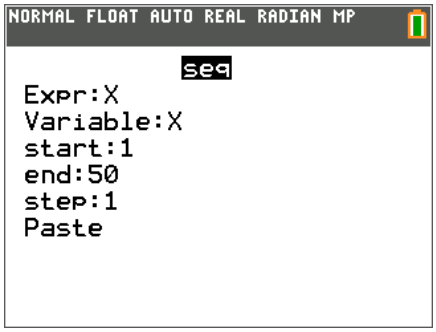
3b. $\sum_{n=1}^{6}\left(\frac{1}{2}\right)^{n}=$

4. $\sum_{n=1}^{6}2\left(\frac{3}{4}\right)^{n-1}=$

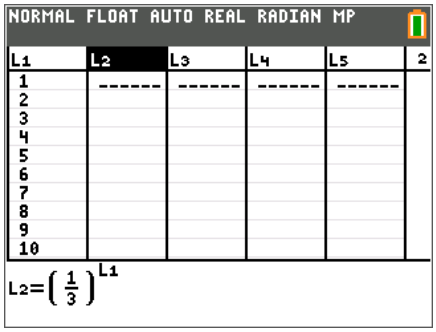
Problem 3 – Convergence and Divergence of Geometric Series

Use Lists to display the terms of each series.

Press stat enter to access the table of data screen.
In **L1**, enter **seq(x,x,1,50)** in the top most cell. The **seq(** command can be found by pressing 2nd stat [list] and arrowing over to **OPS** and selecting **5:seq(**. Enter the information in the **seq** exactly as shown in the screen to the right.



In the top most cell of **L2**, type $\left(\frac{1}{3}\right)^{L_1}$ and enter.

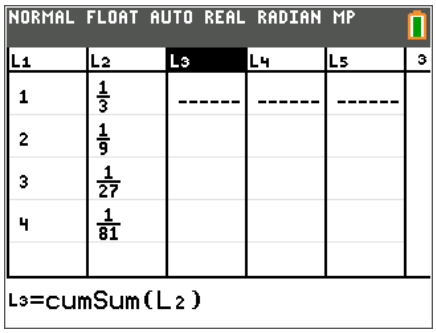


Next we will graph the series.

First we will need to generate a list with the cumulative sums of the terms of the sequence. To do this, move to the top most cell of **L3**, press enter, then press 2nd stat [list] and arrow over to **OPS** and select **6:cumSum(**. Then type 2nd 2 [L2] and press enter.

This will list the first 50 partial sums of the series in **L3**.

Repeat these steps for Problems 5, 6, and 7 below.

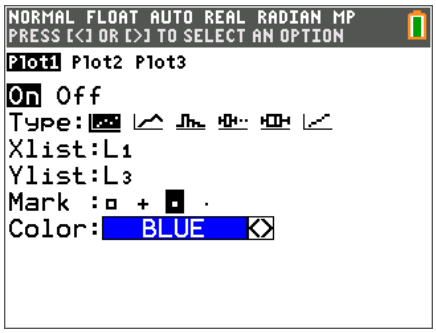


You can view a graph for each series by creating a scatter plot of the values of the partial sums of the series.

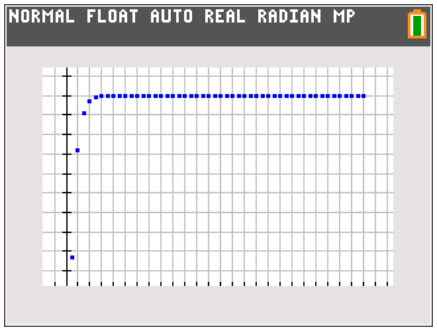
To create a scatter plot, select 2nd y= [stat plot] 1.

Set up as shown in the figure to the right.

To view the graph, press zoom **9:ZoomStat**.



To get an even better view of the behavior of the partial sums, you can change the scaling of the *x* and *y*-axes. Press window and change each of the following: **Xscl:** 2 **Yscl:** 0.2**.**
The graph should look like the screen shown to the right.



Determine the convergence or divergence of each of the following series. Create a scatter plot of the values or the partial sums to aid in determining the behavior of each series.

5. $\sum_{n=1}^{\infty}\left(\frac{1}{2}\right)^{n}$

6. $\sum_{n=1}^{\infty}2\left(\frac{3}{4}\right)^{n-1}$

7. $\sum_{n=1}^{\infty}\frac{2}{3}\left(\frac{3}{2}\right)^{n-1}$