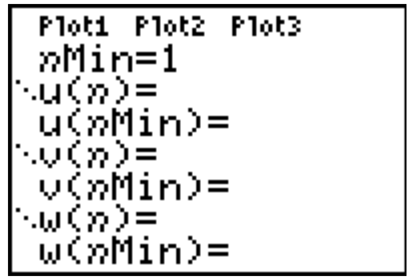
# Geometric Sequences & Series

Name ______________________

Class ______________________

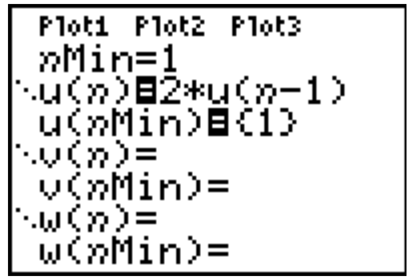
Press [MODE]. Change the fourth line to **SEQ** for sequence mode.

Press [Y=]. You have the capability to define 3 sequences, **u**, **v**, and **w**.




Consider the sequence where $a_1 = 1$ and $a_n = 2 * a_{n-1}$.

To enter this sequence and generate a table of values. ***n*Min** will be 1 because the subscript of our initial term is $a_1$. The **u(*n*)** notation replaces the $a_n$ notation. Define **u(*n*)** as shown. Set **u(*n*Min)** as 1 because $a_1 = 1$.




Press [2nd] [GRAPH] to view the table. Using the table values sketch a graph of the first five terms of the sequence.

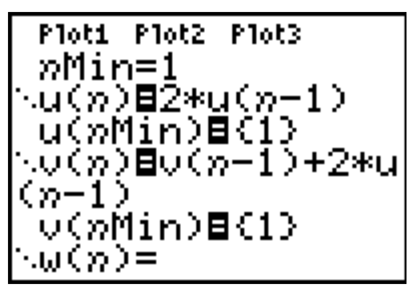
**1.** What appears to be happening in this pattern?

**2.** Is the value of each term changing at a constant rate, a slowing rate or an increasing rate?

**3.** What function produces the same table?

A sum of terms in a *sequence* is a *series*.

Next you will find the partial sums of the terms in the sequence **u(*n*)**. This will be defined like a sequence where the sum for the *n*th term, **v(*n*)**, is the sum for the previous term, **v(*n-1*)**, plus the next term in the sequence **u(*n*)**, which is 2 * **u**(*n* – 1). Define as shown:




**v(*n*)** = **v(*n-1*)** + 2 * **u**(*n* – 1).

Press [2nd] [GRAPH] to view the table.

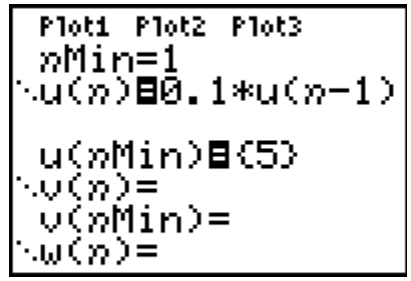
**4.** What is the relationship between the values in **u(*n*)** and **v(*n*)**?

**5.** What is the sum of the first six terms of the sequence **u(*n*)**?

**6.** Scroll down in the table. Do you notice anything more about the sum in column **v(*n*)**? Do the values appear to be stabilizing? Explain.

Consider the sequence where $a_1 = 5$ and $a_n = 0.1 * a_{n-1}$.

To enter this sequence and generate a table of values. ***n*Min** will be 1 because our initial term is $a_1$. The **u(*n*)** notation replaces the $a_n$ notation. Define **u(*n*)** as shown. Set **u(*n*Min)** as 5 because $a_1 = 5$.



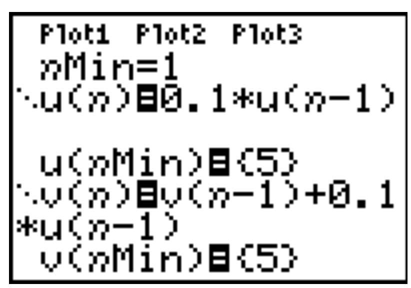

Press [2nd] [GRAPH] to view the table.

**7.** What appears to be happening in this pattern?

**8.** Is the value of each term changing at a constant rate, a slowing rate or an increasing rate?

**9.** What function produces the same table?

Find the sum of the terms in the sequence **u(*n*)**. This will be defined like a sequence where the sum for the *n*th term is the sum for the previous term, **v(*n*–*1*)**, plus the next term in the sequence **u(*n*)**. Define as shown.




Press [2nd] [GRAPH] to view the table.

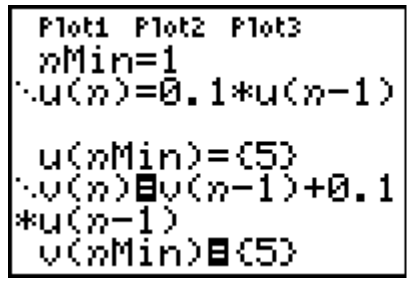
**10.** What is the relationship between the values in **u(*n*)** and **v(*n*)**?

**11.** What is the sum of the first six terms of **u(*n*)**?

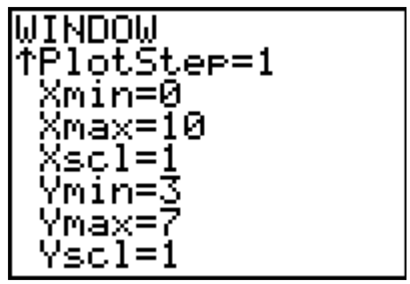
**12.** Do you notice anything more about the sum in column **v(*n*)**?

**13.** Does it appear to be *converging*? That is, does it appear to be approaching a value that it will never exceed?

Return to [Y=]. Right arrow to highlight the equals sign after **u(*n*)** and press **enter** to turn the sign off so that when you graph you will only be graphing the sums from **v(*n*)**.




Press [WINDOW]. Arrow down to set the **Xmin**, **Xmax**, **Ymin**, and **Ymax** as shown at the right.




Press [GRAPH] and [TRACE].

**14.** What is happening to the sum as *n* increases? Is there a value that the sum will never reach?

**15.** Investigate other series. When do series *diverge*, and when do series *converge*?