ALGEBRA II ACTIVITY 9:
GEOMETRIC SEQUENCES AND SERIES
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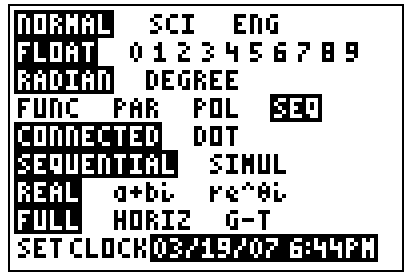
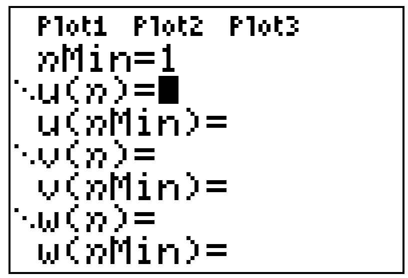
ACTIVITY OVERVIEW:
In this activity we will
- Examine geometric sequences and series in Sequence mode
- Relate geometric sequences to their explicit forms
- Find the partial sums of a sequence in a table
- Determine if a geometric series is converging

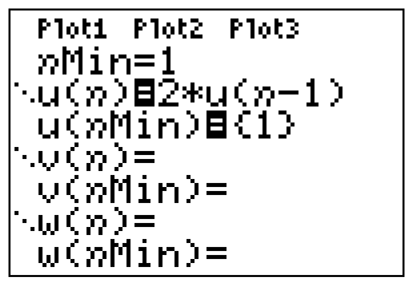


Press [MODE]. Change the fourth line to **SEQ** for sequence mode as shown above.

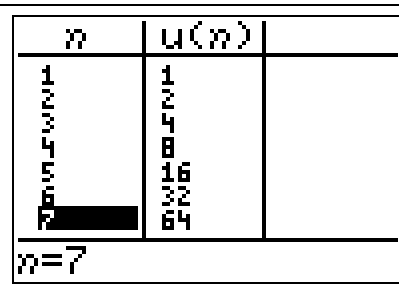
Press [Y=]. You will notice that the screen looks vastly different than when it is in function mode. You have the capability to define 3 sequences, **u**, **v**, and **w**.



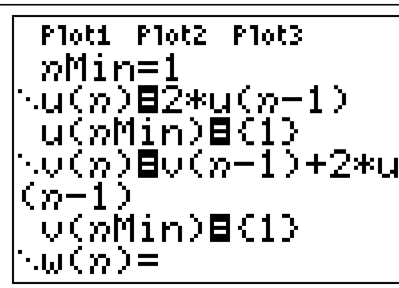
Consider the sequence where a_1=1 and a_n= 2*a_{n-1}. To enter this sequence and generate a table of values. ***n*Min** will be 1 because the subscript of our initial term is a_1. The **u(*n*)** notation replaces the a_n notation. Define **u(*n*)** as shown. Set **u(*n*Min)** as 1 because a_1=1. *Note: the braces will appear after you press enter if you choose not to type them.



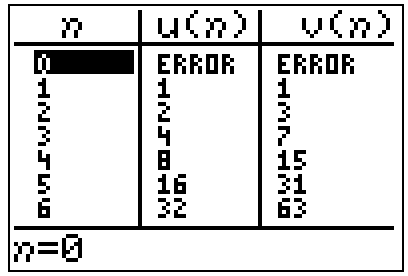
Press [2nd][GRAPH] to view the table. What appears to be happening in this pattern? Is the value of each term increasing at a constant rate, a slowing rate or an increasing rate? What function produces the same table?



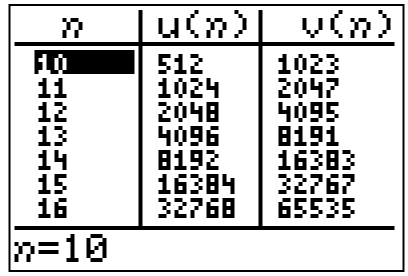
A sum of terms in a *sequence* is a *series*. Next you will ask the calculator to find the partial sums of the terms in the sequence **u(*n*)**. This will be defined like a sequence where the sum for the *n*th term, **v(*n*)**, is the sum for the previous term, **v(*n-1*)**, plus the next term in the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



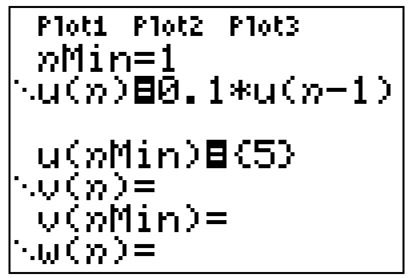
Press [2nd][GRAPH] to view the table. What is the relationship between the values in **u(*n*)** and **v(*n*)**. What is the sum of the first six terms?



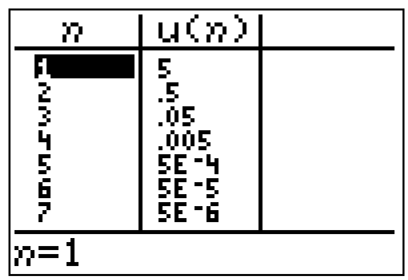
Scroll down in the table. Do you notice anything more about the sum in column **v(*n*)**? Does it appear to be stabilizing?



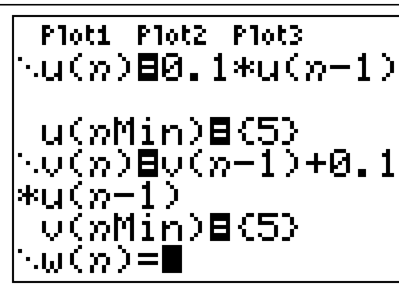
Consider the sequence where $a_1=5$ and $a_n= 0.1*a_{n-1}$. To enter this sequence and generate a table of values. ***n*Min** will be 1 because our initial term is a_1. The **u(*n*)** notation replaces the a_n notation. Define **u(*n*)** as shown. Set **u(*n*Min)** as 5 because $a_1=5$.



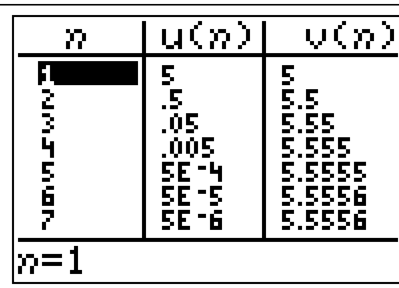
Press [2nd][GRAPH] to view the table. What appears to be happening in this pattern? Is the value of each term decreasing at a constant rate, a slowing rate or an increasing rate? What function produces the same table?



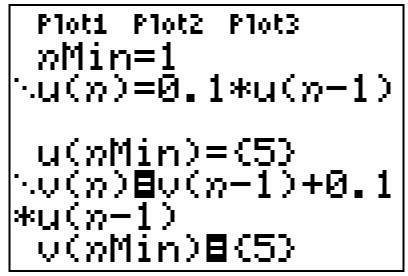
Find the sum of the terms in the sequence **u(*n*)**. This will be defined like a sequence where the sum for the *n*th term is the sum for the previous term, **v(*n-1*)**, plus the next term in the sequence **u(*n*)**. Define as shown.



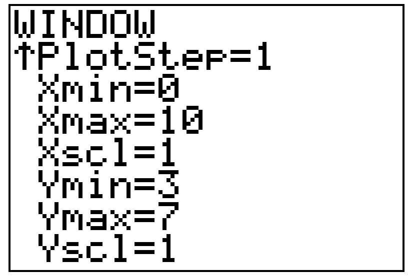
Press [2nd][GRAPH] to view the table. What is the relationship between the values in **u(*n*)** and **v(*n*)**. What is the sum of the first six terms? Do you notice anything more about the sum in column **v(*n*)**? Does it appear to be *converging*? That is, does it appear to be approaching a value that it will never exceed?



Return to Y=. Arrow on top of the equals sign after **u(*n*)**. 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.



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

Investigate other series. When do series continue to take on larger and larger values, and when do series *converge*?