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**.

```
Plot1  Plot2  Plot3
 nMin=1
\u(n)=
 u(nMin)=
\v(n)=
 v(nMin)=
\w(n)=
 w(nMin)=
```

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

To enter this sequence and generate a table of values. **nMin** 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(nMin)** as 1 because $a_1 = 1$.

```
Plot1  Plot2  Plot3
 nMin=1
\u(n)=2*u(n-1)
 u(nMin)={1}
\v(n)=
 v(nMin)=
\w(n)=
 w(nMin)=
```

Press 2nd [TABLE] to view the table.

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.

```
Plot1  Plot2  Plot3
 nMin=1
\u(n)=2*u(n-1)
 u(nMin)={1}
\v(n)=v(n-1)+2*u
(n-1)
 v(nMin)={1}
\w(n)=
```

Press 2nd [TABLE] 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?

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 $a_1 = 5$.

```
Plot1 Plot2 Plot3
nMin=1
\u(n)■0.1*u(n-1)

u(nMin)■{5}
\v(n)=
v(nMin)=
\w(n)=
```

Press [2nd] [TABLE] 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.

```
Plot1 Plot2 Plot3
nMin=1
\u(n)■0.1*u(n-1)

u(nMin)■{5}
\v(n)■v(n-1)+0.1
*u(n-1)
v(nMin)■{5}
```

Press [2nd] [TABLE] 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?

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*)**. Press [ENTER] to turn the sign off so that when you graph you will only be graphing the sums from **v(*n*)**.

```
Plot1 Plot2 Plot3
 nMin=1
\u(n)=0.1*u(n-1)

 u(nMin)={5}
\v(n)◘v(n-1)+0.1
*u(n-1)
 v(nMin)◘{5}
```

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

```
WINDOW
↑PlotStep=1
 Xmin=0
 Xmax=10
 Xscl=1
 Ymin=3
 Ymax=7
 Yscl=1
```

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 continue to take on larger and larger values, and when do series *converge*?