

Name \_\_\_\_\_

Date \_\_\_\_\_

Advanced Algebra

Unit 1: Sequence and Series

I can sum up a partial geometric sequence:

Assignment #8

Partial Sums of a geometric Series:  $S_n = \frac{U_1(1-r^n)}{(1-r)}$

- 1) Find the sum of  $2+6+18+54+\dots$  to 12 terms.

$$\frac{6(1-3^{12})}{(1-3)}$$

Hint: #1 is geometric with  $U_1=6$ ,  $r=3$ , and  $n=12$ . Now use your formula

$$1,594,320$$

- 2) Find a formula as simplified as possible for the first  $n$  terms of  $9+3+1+\dots$

$$\frac{-3(1 - (-\frac{1}{3})^n)}{(1 - -\frac{1}{3})}$$

$$\frac{-3(1 - (-\frac{1}{3})^n)}{\frac{4}{3}}$$

$$-\frac{9}{4} \left(1 - \left(-\frac{1}{3}\right)^n\right)$$

HINT: #2 is geometric with  $U_1=3$  and  $r=-\frac{1}{3}$ . Substitute the information in and simplify as much as you can.

- 3) Find the sum of  $24+12+6+3+\dots$  to 12 terms.

$$\begin{array}{c} \uparrow \quad \uparrow \\ 0 \quad 0 \end{array}$$

$$\frac{24(1 - \frac{1}{2}^{12})}{(1 - \frac{1}{2})} = 23.994$$

$$: S_n = \frac{U_1(1-r^n)}{(1-r)}$$

4) 12+6+3+1.5+...to 10 terms

$$U_0 \uparrow \frac{6(1-\frac{1}{2}^{10})}{(1-\frac{1}{2})} = 11.988$$

5) 20+10+5+2.5+... What is the limit of this series? Show and explain proof on your paper.

$$S_{10} = \frac{10(1-.5^{10})}{(1-.5)} = 19.98$$

$$S_{20} = \frac{10(1-.5^{20})}{(1-.5)} = 19.99$$

barely changing at all  
limit is 20

6) Let  $S_n$  be the sum of an infinite geometric sequence such that  $S_1=3$  and  $S_2=4$

a) State the first term  $U_1$

$$3$$

$$\begin{array}{r} 3 + 3r = 4 \\ -3 \quad \quad \quad \rightarrow \\ \hline 3r = 1 \end{array}$$

b) Calculate the common ratio  $r$

$$.333$$

$$3r = 1$$

$$r = \frac{1}{3}$$

c) Calculate  $U_5$

$$y = U_0 \cdot r^x$$

$$y = 9 \left(\frac{1}{3}\right)^x$$

$$9 \left(\frac{1}{3}\right)^5$$

$$.03685$$

# Assignment #8

Review: Remember simple geometric problems are always written  $y=U_0 \cdot r^x$

**If it is an increasing problem it is always  $(1+r)$**

**If it is a decreasing problem it is always  $(1-r)$**

- 7) You buy a car for \$42,000. The car depreciates 6% every year. Write a direct formula and state what the car will be worth in 10 years.

Direct Formula

$$42,000(1 - .06)^x$$

answer

$$\$22,621.83$$

- 8) You invest \$3,000 into an account that has 5%APR compounded monthly. You also deposit \$200 every month. How much money will be in the account in 8 years?

Shifted Geometric Recursive formula

$$U_0 = 3,000$$

$$U_n = \left(1 + \frac{.05}{12}\right) \cdot \frac{U_{(n-1)}}{(12)} + 200$$

$$n \geq 1$$

Answer

$$\$28,019.86$$

# HC on TEST

- 9) You take out a loan for \$45,000. The APR on the account is 4% compounded monthly. You make monthly payments of \$450. Write the shifted geometric sequence here:

$$U_0 = 45,000$$
$$U_n = \left(1 + \frac{.04}{12}\right) \cdot U_{(n-1)} - 450$$
$$n \geq 1$$

Need to use sequence  
made on the  
calculator

- a) How long will it take you to pay off the loan?

122 Months

$$\begin{array}{r|l} 12 & 377.81 \\ \hline 122 & -70.93 \end{array}$$

- b) How much is your last payment?

\$ 377.81  
379.07 if you include interest

$$377.81 \left(1 + \frac{.04}{12}\right) = 379.07$$

- c) How much in total did you pay?

\$ 9,827.81

$$\begin{array}{r} 121 \times 450 \\ + \\ 377.81 \\ \hline 54,827.81 \\ - 45,000 \\ \hline \end{array}$$