Assignment #5 Solutions

Name_____

Date_____

Advanced Algebra

Unit 1: Sequence and Series Assignment #5

Learning Target: I can model Real World Situations with Recursive Models

1) After financial aid and scholarships, you only need to take out an $8000 loan to pay for the first year of college. The interest on your loan is 3.5% annual interest compounded monthly. You plan to make a payment of $300 each month toward the loan.
   1. Write a recursive sequence for this financial situation.
   2. How many months before the loan is paid off?

U0=8000

Un=(1+.035/12)*U(n-1)-300

n>1

The loan is paid of in 28 total months.

2) You plan to take out a $10000 loan to pay for your vehicle. The interest on your loan is 1.5%, compounded monthly. You plan to make a payment of $200 each month toward the loan.
   1. Write a recursive sequence for this financial situation.
   2. How many months before the loan is paid off?

U0=10,000

Un=(1+.015/12)*U(n-1) -200

The loan is paid of in 94 months

3) Nancy bought a used car for $18,500. The value of the car will be less each year because of depreciation. The car depreciates at the rate of 16% per year.

y=18500(1-.16)^x

Now that you have a direct formula you can easily find what the car is worth after any amount of time

4) The Smiths have a small pool and are doing a chlorine treatment. The recursive formula below gives the pool's daily amount of chlorine in grams.

$$\begin{cases} U_0 = 300 \\ U_n = (1 - .15) * U_{(n-1)} \\ n \geq 1 \end{cases}$$

There should have been a +30 here

   a) Explain that the real- world meaning of the values 300, .15 and 30 represent in this formula.
   b) Describe what happens to the chlorine level in the long run (This means find the limit of this recursive formula, CLICK IT OUT)

The 300 is the initial amount of chlorine in the pool

the .15 is what it is decreasing by

and the 30 is what you are adding each time

The long run value of chlorine levels out at 200 grams of chlorine

U0=24,000
Un=(1+.034/12)*U(n-1)-100
n>1

5) Sal invested $24,000 into a bank account. This account earned interest. The APR on this account was 3.4% compounded monthly. He decides to make monthly withdraws of $100 every month (this means he takes money out of the account).

   a) Write the recursive formula for this problem.
   b) What is his balance after 1 year?   Balance after 1 year is $23,968
   c) What is the long –run balance of this scenario...meaning what is the LIMIT of this
      problem.   He will eventually run out of money. He will empty this account after many years of doing this

6) The Forever Green Nursery owns 7000 white pine trees. Each year, the nursery plans to sell 12% of its trees and plant 600 new ones.
a) Find the number of pine trees owned by the nursery after 10 years?
b) Find the number of pine trees owned by the nursery after many years. (This is another way to ask for the LIMIT of the sequence...CLICK IT OUT)

U0=7000
Un=(1-.12)*U(n-1)+600
n>1

The limit of the sequence is 5000 trees

7)Consider a $1000 investment at an annual interest rate of 6.5% compounded quarterly. Find the balance after :
a) 10 years_____$y=1000(1+.065/4)^{40}$_____ $1905.56
b) 20 years____$y=1000(1+.065/4)^{80}$ because there are 4 clicks in a year $3,631.15
c) 30 years___$y=1000(1+.065/4)^{120}$ because there are 4 clicks in a year $6,919.38

8) Find the balance of a $1,000 investment, after 10 years, at an annual interest rate of 6.5% when it is compounded
a) Annually_____$y=1000(1+.065)^{10}$_____ $y=$1,877.14
b) Monthly___$y=1000(1+.065/12)^{120}$_____ $y=$1912.18
c) Weekly __$y=1000(1+.065/52)^{520}$_____ $y=$1914.76

9) You borrow $10,000 at an annual interest rate of 10%, compounded monthly, and you make monthly payments of $300.
a) Write the recursive to describe this
b) What is the balance after 2 years? The balance after 2 years is $9564.86
c) How long does it take to pay off?
d) What was the total amount you ended up paying_____

U0=10000
Un=(1+.10/12)*U(n-1)-300
n>1

C) I just need to use sequence mode in my calculator and I get 40 total months.

d) I paid 39 months of 300 and 1 month of 63.63 this makes a total of $11,763.63