Name_____

Date_____

Advanced Algebra

Assignment Sequence and Series Assignment #14 Test Review #1

I can write a direct formula for an arithmetic sequence and a geometric sequence.

Write the direct formula for the following sequences.

1) $\begin{cases} U_1 = 18 \\ U_n = U_{(n-1)} + 4 \\ n \geq 2 \end{cases}$

direct formula for #1

$y = 4x + 14$

2) $\begin{cases} U_0 = 18 \\ U_n = .25 * U_{(n-1)} \\ n \geq 1 \end{cases}$

direct formula for #2

$y = 18(.25)^x$

3) $\begin{cases} U_1 = -5 \\ U_n = U_{(n-1)} - 22 \\ n \geq 2 \end{cases}$

direct formula for #3

$y = -22x + 17$

4) $\begin{cases} U_0 = 5 \\ U_n = 2 * U_{(n-1)} \\ n \geq 1 \end{cases}$

direct formula for #4

$y = 5 \cdot 2^x$

I can find limit of a shifted geometric sequence:

Key Point: You can rapidly click these out on your calculator. You should be able to enter this quickly at this point and click it out.

Method #2: You could enter into sequence mode and look up a big table value. For example start your table at 100.

I clicked them All out on my calculator

You could put them in sequence Mode And go to a far out x value on your table

$\begin{cases} U_0 = 18 \\ U_n = .78 * U_{(n-1)} - 2 \\ n \geq 1 \end{cases}$

$\begin{cases} U_0 = 200 \\ U_n = .68 * U_{(n-1)} + 4 \\ n \geq 1 \end{cases}$

$\begin{cases} U_0 = 300 \\ U_n = .32 * U_{(n-1)} - 18 \\ n \geq 1 \end{cases}$

Limit for #1

-9.09

Limit for #2

12.5

Limit for #3

-26.47

Key Point: There is NO LIMIT for all arithmetic sequences. It does not matter if it is an increasing or a decreasing arithmetic sequence. Arithmetic= **NO LIMIT**

Key Point: Geometric Sequences. **Geometric Increasing sequences does NOT have a limit.**

Geometric Decreasing the Limit is ZERO.

You can always verify that by clicking it out on your calculator.

Applications are a key learning target when dealing with sequences.

1) A Tree nursery harvests 38% of its trees each year for selling. However they plant 200 trees each year to maintain their tree farm. The nursery started its operation with 1000 trees.

a) Write the direct (if applicable) and the recursive sequence to describe this scenario.

~~Direct formula~~ Shifted Geometric
$U_0 = 1,000$
$U_n = (1-.38) \cdot U_{(n-1)} + 200$
$n \geq 1$

Recursive formula $U_0 = 1,000$
$U_n = (1-.38) \cdot U_{(n-1)} + 200$
$n \geq 1$

b) How many trees does the farm have after 5 years?

Final answer
569 Trees

c) What is the long run number of trees that this nursery has at any moment in time. (This means limit)

I checked the table at U_{100} and all entries look like 526

Final answer to limit
526 Trees

2) You deposit $500 into an account that earns 6% APR. You make no other deposits. What is the balance of the account in 6 years?

Direct Equation
$Y = 500(1.06)^X$

Final answer
$709.26

click it 6 times

Assignment #14 Review for TEST

3) You deposit $1,000 into an account that earns 7% APR. You make no other deposits. How many years does it take for the account to triple?

Direct Equation

$y = 1000(1+.07)^x$

$3000 = 1,000(1.07)^x$

$3 = 1.07^x$

Use Table in Function Mode

put 1.07^x into $y=$ And search where y is equal to 3

Final Answer

16 years

4) You deposit $300 into an account that earns 8.25% APR compounded monthly. You make no other deposits. What is the account balance in 5 years?

Direct Equation

$y = 300\left(1+\frac{.0825}{12}\right)^x$

$12 \times 5 = 60$ clicks

Final answer

$452.54

5) You buy a boat for $32,000. The boat depreciates 7% each year. What is the value of the boat in 8 years?

Direct Equation

$y = 32,000(.93)^x$

$32,000(.93)^8$

Final answer

$17,906.62

6) You buy a boat for $40,000. The boat depreciates 6% each year. How many years does it take for the boat to have a value of $32,000.

Direct Equation

$y = 40,000(.94)^x$

$\frac{40,000(.94)^x}{40,000} = \frac{32,000}{40,000}$

$.94^x = .8$

Just like #3 put $.94^x$ into $y=$ And search the table for when it

Final Answer

3.6 years

7) You take out a loan for college. The amount that you take out is $50,000. The APR on this account is 5% compounded monthly. You make no payments on this account during college. What is the loan balance in 4 years?

Direct Equation

$y = 50{,}000\left(1+\frac{.05}{12}\right)^{48}$

Final Answer

$61,044.77

I can use sequence mode to help solve shifted applications.

1) You take out a loan for $45,000 to buy a car. The APR on the account is 5.25% compounded monthly. You also make $500 payments each month. Write the recursive sequence for this scenario. What is the loan balance after 1 year? How long does it take to pay off the loan? How much money have you paid for the car?

*Make sure you can write a proper sequence

Shifted Geometric Recursive Formula for this

$$\begin{cases} U_0 = 45{,}000 \\ U_n = \left(1+\frac{.0525}{12}\right) * U_{(n-1)} - 500 \\ n \geq 1 \end{cases}$$

Now use calculator in Sequence Mode

114|319.63
115|-179.97

Final Answer

115 Total Months

114 x 500 + 179.97

Total paid $57,179.97

2) The following sequence represents a loan measured in MONTHS

$$\begin{cases} U_0 = 2{,}000 \\ U_n = (1+\frac{.122}{12}) * U_{(n-1)} - 150 \\ n \geq 1 \end{cases}$$

What is the initial amount that was borrowed?

$2,000

What is the deposit or payment amount?

$150 payment

What is the APR on this LOAN?

12.2%

*Make sure you can Read a Shifted Sequence & know what the values Mean in Real life

What is the APR being compounded by Monthly

SUMS

1) What is the arithmetic sum S_{12} if $U_2=8$ and $U_4=14$

$S_n=\frac{n(U_1+U_n)}{2}$

$\frac{14-8}{2}=\frac{6}{2}=3$ common difference

$U_{12}=5+11(3)=38$

$U_1=5$

$S_{12}=\frac{12(5+38)}{2}$

258

2) What is the arithmetic sum S_{50} if $U_1 = 18$ and the common difference is 3

$S_n=\frac{n(U_1+U_n)}{2}$

$U_{50}=18+49(3)$

$U_{50}=165$

$S_{50}=\frac{50(18+165)}{2}$

4575

High Challenge Sums Problem:

The sum of an arithmetic series to 20 terms is 710. The sum of the same arithmetic series to 50 terms is 4025.

Find U1 and the common difference. You need to use the sum's formula and simplify. You substitute $U_n=U_1+(n-1)d$ in for Un and you solve a system of 2 equations and 2 unknowns by doing elimination.