

Name _____

Date _____

Advanced Algebra

Unit 1: Sequence and Series

Assignment #9 (This is review)

Foundational Problems:

- 1) The first three terms of a sequence are -2, -9, and -16

- a) Write down the next two terms

$$-23, -30$$

- b) Find a direct formula for the nth term of this sequence

$$y = -7x + 5$$

$$U_0 = 5$$

$m = -7$

$$U_1 = -2$$
$$U_n = U_{(n-1)} - 7$$

$n \geq 2$

- 2) The first three terms of a geometric sequence are 0.75, 2.25, and 6.75

- a) Find the common ratio

$$r = 3$$

$U_0 \quad U_1$

- b) Write down the formula for the nth term

$$y = .75(3)^x$$

- c) Calculate the sum of the first 10 terms $\frac{U_1(1-r^n)}{(1-r)}$

$$\frac{2.25(1-3^{10})}{(1-3)}$$

66,429

Assignment # 9

U_0 ↓

3) $20+10+5+2.5+\dots$

a) Write the geometric sequence for where this series came. Remember a Sequence uses commas and a series has plus's between terms. So this is asking you to write the geometric Recursive Sequence.

$$U_0 = 20$$

$$U_n = .5 \cdot U_{(n-1)}$$

$$n \geq 1$$

b) Find the sum of the first 12 terms

$$U_1 = 10$$

$$\frac{10(1 - .5^{12})}{(1 - .5)} = \underline{19.99}$$

$$\frac{10(1 - .5^{20})}{(1 - .5)} = \underline{19.999}$$

c) What is the limit of the sums of this series?

20

Fundamental Question on TEST

4) How many numbers in a sequence do you need to know for the sequence to be defined?

** You need to know at least 3 numbers or you would not know what it is

5) You deposit \$200 into an account with an APR that earns 7.2% compounded monthly. Write the direct equation and How much money will you have in 5 years?

Direct Equation

$$y = 200 \left(1 + \frac{.072}{12} \right)^{60}$$

Answer after 5 years

\$ 286.36

Assignment #9

8) The sixth term of an arithmetic sequence is 49 and the fifteenth term is 130.

a) Find the common difference for this sequence

$$U_6 = 49 \quad U_{15} = 130$$

b) Find the first term

$$49 = U_1 + 5(9)$$

$$U_1 = 4$$

$$\frac{130 - 49}{15 - 6} = \frac{81}{9} = 9$$

c) How many terms of this sequence have a value less than 300?

$$y = 9x - 5$$

$$300 = 9x - 5$$

$$x = 33.88$$

$$U_{34} = 301$$

$$\text{So } 33 \text{ Terms}$$

9) You deposit \$200 into an account with an APR that earns 7.2% compounded monthly and you also make \$50 deposits every month as well.

a) Write the recursive formula for this scenario.

$$U_0 = 200$$

$$U_n = \left(1 + \frac{0.072}{12}\right) U_{(n-1)} + 50$$

$$n \geq 1$$

b) Use Sequence mode on your calculator to find the balance after 10 years.

\$9,160.15

120 clicks
or
Sequence mode
U(120)

c) Use algebra to write the direct formula for this shifted geometric sequence

$$y = A \cdot r^x + k$$

(0, 200)
(1, 251.2)

$$200 = A \cdot r^0 + k$$

$$251.2 = A \cdot 1.006 + k$$

$$y = 8533.33 \cdot (1.006)^x - 8333.33$$

$$200 = A + k$$

$$-251.2 = 1.006A + k$$

$$-51.2 = -.006A$$

$$8,533.33 = A$$

$$k = -8333.33$$

d) Check that your 2 equations give you the same list.

Works
OO
)

0	200
1	251.2
2	302.71
3	354.52
4	406.65

Good AC
Problem

Moderate Sequence and Series Problems:

6) Write down the first 3 terms of the sequence given by $U_n = n(n+1)$

a) Find the 15th term

$$U_1 = 1(1+1)$$

$$U_1 = 2$$

$$U_2 = 2(2+1)$$

$$U_2 = 6$$

$$U_3 = 3(3+1)$$

$$U_3 = 12$$

$$U_{15} = 15(15+1)$$

$$240$$

b) Which term of this sequence is 600?

$$600 = n(n+1)$$

$$600 = n^2 + n$$

$$0 = n^2 + n - 600 \quad (n+25)(n-24)$$

$$n = -25 \quad n = 24$$

24th Term

* This uses quadratic skills!!
That is why they need to be mastered

7) The first three terms of an arithmetic sequence are -347, $k-166$, and -185

a) Find the value of k

$$k-166 - (-347) = -185 - (k-166)$$

$$k+181 = -k-19$$

$$2k = -200$$

$$k = -100$$

b) Find the formula for the n^{th} term of the sequence

$$y = 81x - 428$$

$$\begin{array}{r} -347 \\ -266 \\ -185 \end{array} \begin{array}{l} +81 \\ +81 \\ +81 \end{array}$$

c) Which is the first positive term of the sequence

Term 6

x	y
0	-428
1	-347
2	-266
3	-185
4	-104
5	-23
6	58

Great HC when you need to make substitutions into

High Challenge Sequence and Series Problems. Hint: You will need your U_n formula ($U_n = U_1 + (n-1)d$) and the series formula. You will need to do some substituting.

Formula

- 10) The sum of the first 7 terms of an arithmetic series is 329. The common difference is 14
 a) Find the value of the first term.

$$S_7 = \frac{7(U_1 + U_7)}{2}$$

Since I have 2 variables I need to substitute for U_n . I know

$$U_n = U_1 + (n-1)d$$

$$329 = \frac{7(U_1 + U_1 + (7-1)d)}{2}$$

$$U_1 = 5$$

- b) Find n given 69,800 is the sum of the first n terms of the sequence.

$$94 = 2U_1 + 6 \cdot 14$$

$$94 = 2U_1 + 84$$

$$10 = 2U_1$$

$$5 = U_1$$

$$n = 100$$

b) $69800 = \frac{n(U_1 + U_n)}{2}$ $U_n = U_1 + (n-1)d$

$$139,600 = n(U_1 + U_1 + (n-1)d)$$

* $d = 14$

$$n(10 + (n-1)14)$$

$U_1 = 5$

$$n(10 + 14n - 14)$$

$$139,600 = 14n^2 - 4n$$

$$0 = 14n^2 - 4n - 139,600$$

$$14 \pm \sqrt{16 - 4(14)(-139,600)} \quad 4 \pm \sqrt{16 - 4(14)(-139,600)}$$

$$\frac{4 \pm 2796}{28} \quad (100) \cdot 28$$

* Since it is Quadratic, I know we need everything to one side then Factor