Notes 9.1

**Definition:** A **sequence** is an ordered list of numbers, called **terms**. The terms are often arranged in a pattern, but not always.

Example 1: Write the first four terms of the sequence defined by the explicit formula

$a_n = 3n+1$

$a_1 = 3(1)+1 = 4$
$a_2 = 3(2)+1 = 7$
$a_3 = 3(3)+1 = 10$
$a_4 = 3(4)+1 = 13$

The first four terms are : 4, 7, 10, 13

$a_{500} = 3(500)+1 = 1501$

Could you find the 500th term?? DO IT!!!
This formula is called an ~~explicit formula.~~ It allows you to find any term by just substituting that term number in for n. **E**xplicit formulas make it ~~EEEEEEEEEEASY~~ to find terms.

Example 2: 2,5,8,11,14,17,20,23,…
Please circle the 4th term $(a_4)$. Does term 4 have the value of 4?????? NO!!!!!! The term number (n) is 4, not its value. The term's value is 11. The term number (n) tells you where it is in the sequence.

Example 3: $a_n = 4-n$

Find a) the 75th term b) $a_{12} = 4-12 = -8$ c) the first four terms 3,2,1,0

a) $a_{75} = 4-75 = -71$

$a_1 = 4-1 = 3$
$a_2 = 4-2 = 2$
$a_3 = 4-3 = 1$
$a_4 = 4-4 = 0$

~~**Definition:** A **recursive formula** uses one or more of the previous terms to generate the next term.~~

**Example 4**: Find the first four terms of the sequence defined by the given recursive formula.

find previous term

$a_n = a_{n-1} + 4$

$a_1 = 5 \;;\; n \geq 2$

$a_1 = 5$
$a_2 = a_{2-1} + 4 = a_1 + 4 = 5+4 = 9$
$a_3 = a_{3-1} + 4 = a_2 + 4 = 9+4 = 13$
$a_4 = 13+4 = 17$

The first 4 terms are : 5, 9, 13, 17

**Example 5**: Write the firs 5 terms of the sequence defined by the recursive formula

$a_n = 3a_{n-1} - 7$

$a_1 = 5 \quad n \geq 2$

$a_1 = 5$

$a_2 = 3 \cdot a_{2-1} - 7 = 3 \cdot a_1 - 7 = 3(5) - 7 = 8$

$a_3 = 3 \cdot a_2 - 7 = 3(8) - 7 = 24 - 7 = 17$

$a_4 = 3(17) - 7 = 44$

$a_5 = 3(44) - 7 = 125$

The first five terms are: 5, 8, 17, 44, 125

Can you easily find me the 100th term in example 5? NO

Example 6:

Write the recursive formula (recursive definition) for the following sequences:

a) 400, 390, 380, 370,… (-10)

$a_1 = 400$

$a_n = a_{n-1} - 10 \; ; n \geq 2$

b) 2,10,50,250,… (1st one in sequence is 2)

$a_1 = 2$

$a_n = 5a_{n-1}$ if $n \geq 2$

c) 9.5, 11, 12.5 ,14 ,…

$a_1 = 9.5$

$a_n = a_{n-1} + 1.5$ if $n \geq 2$

d) 1600,-800,400,-200,…

$a_1 = 1600$

$a_n = -\frac{1}{2} a_{n-1}$