# Honors Algebra II

## Notes Section 7.5

### Use Recursive Rules with Sequences and Functions

**Explicit Rule:** give $a_n$ as a function of the term's position number (n) in the sequence.

**Recursive Rule:** gives the beginning term/terms of a sequence and then an equation that tells how $a_n$ is related to one or more preceding terms.

**Arithmetic Sequence:** $a_n = a_{n-1} + d$ ; $d =$ _____

**Geometric Sequence:** $a_n = r \cdot a_{n-1}$ ; $r =$ _____

**Iteration:** repeated composition f(g(x)) of a function with itself.

**EXAMPLE 1** Write the first six terms of the sequence.

a) $a_0 = 1$ , $a_n = a_{n-1} + 4$

$a_0 = 1$

$a_1 =$ _____

$a_2 =$ _____

$a_3 =$ _____

$a_4 =$ _____

$a_5 =$ _____

b) $a_1 = 1$ , $a_n = 3a_{n-1}$

$a_1 = 1$

$a_2 =$ _____

$a_3 =$ _____

$a_4 =$ _____

$a_5 =$ _____

$a_6 =$ _____

**EXAMPLE 2** Write a recursive rule for the sequence.

a) 3, 13, 23, 33, 43, . . .

type: _____

d = _____

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

b) 16, 40, 100, 250, 625, . . .

type: _____

r = _____

$a_n = r \cdot a_{n-1}$

**EXAMPLE 3** Write a recursive rule for the sequence.

a) 1, 1, 2, 3, 5, . . .

Note** Beginning with the 3rd term each term is the sum of the 2 previous terms.

$a_1$ = _____ $a_2$ = _____

_____

b) 1, 1, 2, 6, 24, . . .

$a_0 = 1$

$1 \cdot 1$ = _____ $a_1$ = _____

$2 \cdot 1$ = _____ $a_2$ = _____

$3 \cdot 2$ = _____ $a_3$ = _____

$4 \cdot 3$ = _____ $a_4$ = _____

_____

**EXAMPLE 4** An online music service initially has 50,000 annual members. Each year it loses 20% of its current members and adds 5000 new members.

a) Write a recursive rule for the number $a_n$ of members at the start of the $n^{th}$ year.

b) Find the number of members at the START of the 5th year.

Note** Show how to do on the calculator to save time!

$a_1$ = _____

$a_2$ = _____

$a_3$ = _____

$a_4$ = _____

c) Describe what happens to the number of members over time.

_____

**EXAMPLE 5** Find the first 3 iterates $x_1$, $x_2$, and $x_3$ of the function: $f(x) = -3x + 1$ for an initial value of $x_0 = 2$.

$x_1$ = _____ $x_2$ = _____ $x_3$ = _____

The first three iterates are _____.