Unit 2B Packet

- Function notations
- Function operations
- Characteristics of functions
- Arithmetic Sequences

Name: _____

Algebra 1
Introduction to Functions

Name: _____
Date: _____

Warm-Up:

How do we remember order of operations?

1. $15 \times 2 \div 6$
2. $3(7-1)-4$
3. $6-4 \div 2+5$
4. $2-(1-3) \times 2$

A _____ is a relationship between two sets of data.

Every relation has a **domain** and a **range**.

Domain: _____ _____ _____

Range: _____ _____ _____

A _____ is a special relation in which each input is mapped to only one output.

[In other words, no _____ _____.]

Consider the following relation: **{ (-1 , 4), (2 , 0), (-4 , -7), (3 , 5), (4, -1) }**

Function? _____ Domain: _____ Range: _____

Consider the following relation: **{ (2, -3), (1 , 6), (-5 , -4), (2 , 4), (6, 0) }**

Function? _____ Domain: _____ Range: _____

Consider the following relation: **{ (-2 , 2), (-1 , 2), (0 , 2), (1 , 2), (2, 2) }**

Function? _____ Domain: _____ Range: _____

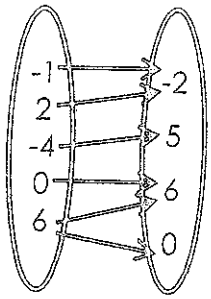
Determine if the following tables and mappings are functions. Describe the domain and range.

x	y
-2	14
1	10
4	6
7	2
11	-2

Function? _____

Domain: _____

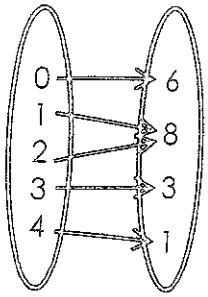
Range: _____



Function? _____

Domain: _____

Range: _____



Function? _____

Domain: _____

Range: _____

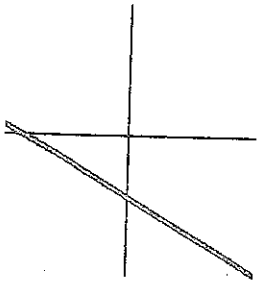
x	y
2	7
-1	2
0	-5
4	3
4	-2

Function? _____

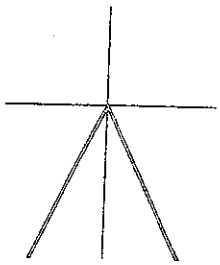
Domain: _____

Range: _____

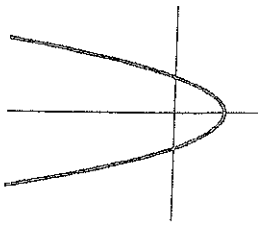
In order to determine if a *graph* is a function, use the vertical line test.



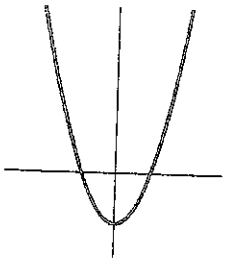
Function? _____



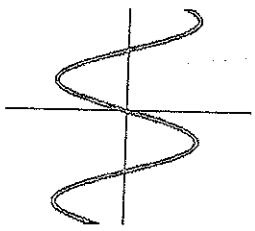
Function? _____



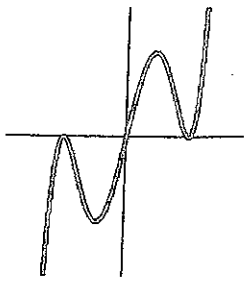
Function? _____



Function? _____



Function? _____



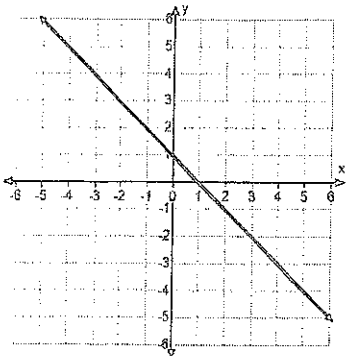
Function? _____

Algebra 1
Function Notation and Evaluation

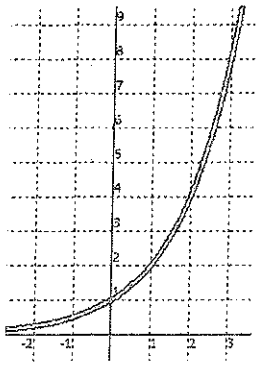
Name: _____

Date: _____

Warm-Up: Fill out the table.



x	y
-4	
-1	
1	
2	
5	



x	y
-1	
0	
1	
2	
3	

_____ _____ is a way to name a function using f(x) instead of y.

$$y = 2x + 3 \iff f(x) = 2x + 3$$

$$y = -3x - 1 \iff \_\_\_\_\_$$

*** Common variables for function notation: f(x), g(x), h(x) ***

Evaluating function notation:

Given: f(x) = –3x + 4 $\quad g(x) = \frac{x}{2} - 3$ h(x) = 3^x + 2

f(2) = –3(2) + 4
f(2) = –6 + 4
f(2) = –2

Ex: To evaluate f(2) in f(x) = –3x + 4, replace all x's with 2 and simplify.

1. f(5)
2. f(–1)
3. g(8)

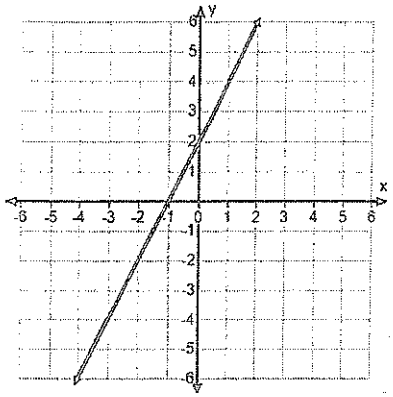
4. h(0)
5. g(–10)
6. f(–6)
7. h(2)
8. h(–1)

Given the function g(x) = {(1,2),(2,4),(3,7), (0,3), (-1,1) }, find each of the following:

1. g(3) _____
2. g(1) _____
3. g(2) _____

Evaluate $f(x) = -4x + 7$ over the domain {1, 2, 3, 4}. What is the range?

Given the graph below, find each of the following.



1. f(–4) _____
2. f(–1) _____
3. f(1) _____
4. f(0) _____
5. f(-3) _____
6. f(2) _____

Use the functions to answer the following questions: $f(x) = 3x + 1$ $g(x) = -2x + 1$ $h(x) = \frac{x-3}{2}$

1. f(-1) + g(4) = _____
2. h(7) + f(3) = _____
3. g(-3)*f(5) = _____
4. h(-1)*g(2) = _____
5. 5f(-6) = _____
6. 2g(-3) + f(1) = _____

Algebra 1
Classwork/Homework – Functions

Name: _____

Date: _____

Determine if the following relations are functions. Describe the domain and range.

1. {(5, -1), (0 , 3), (-2 , -4), (6 , -1) (-2 , 3) }

   Function? _____ Domain: _____ Range: _____

2. {(9 , 2), (-4 , -1), (0 , -3), (-7 , 6) (5 , -2) }

   Function? _____ Domain: _____ Range: _____

Determine if the following tables and mappings are functions. Describe the domain and range.

3.

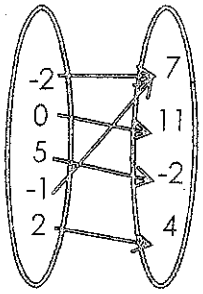
x	y
3	9
8	24
-2	-6
0	0

Function? _____

Domain: _____

Range: _____

4.

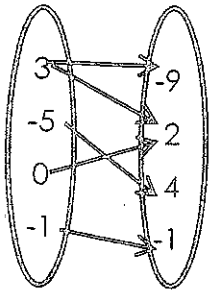


Function? _____

Domain: _____

Range: _____

5.



Function? _____

Domain: _____

Range: _____

6.

x	y
-6	8
2	3
-6	-11
4	-2

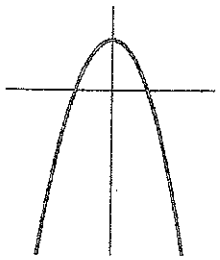
Function? _____

Domain: _____

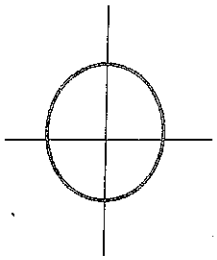
Range: _____

Determine if the following graphs are functions. Use the vertical line test.

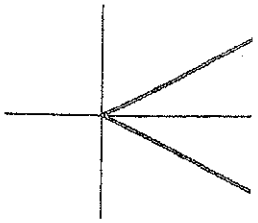
7. Function? _____



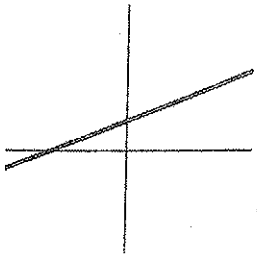
8. Function? _____



9. Function? _____



10. Function? _____



Algebra 1
Classwork – Function Notation and Evaluation

Name: _____

Date: _____

Given:	$f(x) = 4x - 2$	$g(x) = 2^{x-6}$	$h(x) = \frac{x}{5} + 7$

1. $f(-3) =$ _____
2. $g(0) =$ _____
3. $g(2) =$ _____

4. $f(6) =$ _____
5. $h(10) =$ _____
6. $h(-15) =$ _____

7. Given the function $f(x) = \{(-1,0),(-2,2),(-3,-1)\}$, find $f(-1)$.

8. GIVEN: $f(x) = 2x - 3$ and $g(x) = x - 2$

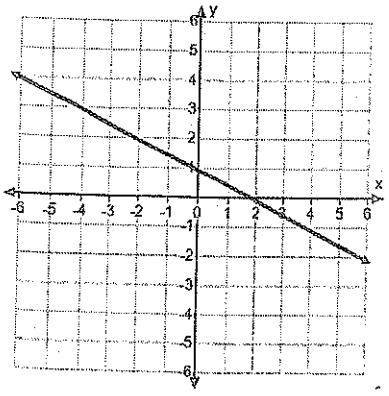
A. $f(2) + g(0)$

B. $f(-8) - 3f(2)$

C. $g(10)*f(-4)$

9. **Evaluate** $f(x) = -2x + 1$ over the domain $\{-2, 0, 1, 5\}$. What is the range?

Given the graph below, find each of the following.



10. $f(-6)$. _____
11. $f(2)$ _____
12. $f(-4)$_____

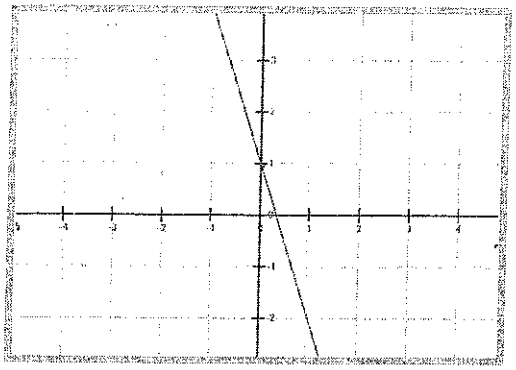
13. $f(4)$ _____
14. $f(-5)$_____
15. $f(0)$ _____

Algebra 1
Function Notation, Day 2

Name: _____
Date: _____ Period: ____

Warm-up: For each, evaluate f(1). Use the function statement to create an ordered pair solution.

1.



f(1) = _____ → (____, ____)

2.

x	0	1	2	3
f(x)	-3	2	-4	1

f(1) = _____ → (____, ____)

3. f(x) = 3x + 13

f(1) = _____ → (____, ____)

When you are given a problem in the form f(1) = (blank), the number 1 represents the Domain (x-value), and your job is to find the corresponding y-value. What if instead you were given f(blank) = 1. In this case, the number 1 represents the range (y-value) and your job would be to give the x-value that result in this output. Let's try a few:

Using each of the functions ABOVE, determine where f(x) = 1.

1. f(__0__) = 1 (graph) 2. f(_____) = 1 (table) 3. f(_____) = 1 (function)

(0, 1) when y = 1 what is x?

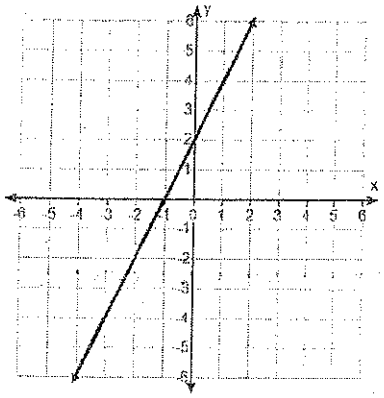
Exercises: Fill in the blank with the correct x-value.

4. If g(x) = 4x – 7, determine when g(x) = 21.
g(_____) = 21

$21 = 4x - 7$
$28 = 4x$
$x = 7$

5. If h(x) = 3 – 2x, determine when h(x) = -9.
h(_____) = -9

6. Use the graph to fill in each blank.



a.) f(-4) = _____ c.) f(_____) = -4

b.) f(0) = _____ d.) f(_____) = 0

7. Use the table to fill in each blank.

x	-2	0	3	5
f(x)	5	1	2	0

a.) f(5) = _____ c.) f(_____) = 5

b.) f(0) = _____ d.) f(_____) = 0

ALGEBRA 1
Graded Task

Name: _____

Date: _____

Sample problem: Given the function f(x) = -3x + 7, find

a. f(-5)

$f(-5) = -3(-5) + 7$

$= 15 + 7 = \boxed{22}$

b. the value of x for which f(x) = -5

$-3x + 7 = -5$

$-7 \quad -7$

$-3x = -12$

$\boxed{x = 4}$

Make sure to substitute w/ parenth.

Part 1: Use $f(x) = \frac{x-1}{4}$, g(x) = 5 – 2x, and $h(x) = x^2 + 2$ to answer each question.

1. f(17) = _____ 2. g(4) = _____ 3. h(2) = _____ 4. f(x) = -6; x = ____ 5. h(-3) = _____

$h(-3) = (-3)^2 + 2$

6. g(x) =11; x = ____ 7. f(x) = 9; x =_____ 8. f(9) = _____ 9. f(2) = _____ 10. g(x)= -17; x=_____

Part 2: Use f(x) = -x + 4, g(x) = 10x – 8, and $h(x) = \frac{x}{3} - 5$ to answer each question.

11. f(2) + g(-3) = _____ 12. f(10) – h(12) = _____ 13. 4g(2) = _____

14. h(-3)*f(12) = _____ 15. h(30)*g(-3) = _____ 16. h(6) + 3g(1) – 2f(-5) = _____

Algebra 1
Rate of Change

Name: _____
Date: _____ Period: ____

Warm-Up

$f(x) = -2x + 4$	$g(x) = 3^x - 1$	$h(x) = x^2 + 7$

1. $h(-3) =$ _____ 2. $g(0) =$ _____ 3. $f(x) = -10$; $x =$ _____ 4. $f(4) - g(1) =$ _____

REMINDERS

Rate of Change: describes how one quantity _____ as another quantity _____.

Average Rate of Change Formula: _____

Positive ROC: _____

Negative ROC: _____

Linear functions have a _____ rate of change, meaning values increase or decrease at the SAME rate over a period of time.

Non-Linear functions DO NOT have a constant rate of change, meaning values increase or decrease at different rates over a period of time.

Horizontal Lines have _____ rate of change.

Vertical Lines have _____ rate of change.

SLOPE BETWEEN TWO POINTS

1. (4, 6) and (-2, -4) 2. (7, 5) and (7, -8) 3. (-5, 10) and (1, -2)

TABLES

Find the slope of the line represented by the table. Then describe the function as increasing, decreasing, horizontal, or vertical.

1.

x	y
-2	3
-1	5
0	7
1	9
2	11

m = _____
description:

2.

x	y
-5	10
-3	6
-1	2
1	-2
3	-6

m = _____
description:

3.

x	y
-4	6
-2	6
0	6
2	6
4	6

m = _____
description:

4.

x	y
5	2
5	4
5	6
5	8
5	10

m = _____
description:

RATE OF CHANGE OVER INTERVAL

1. $f(x) = 3 - 2x$ over the interval [2, 3].

2. $k(x) = 3x + 4$ over the interval [-2, 3].

3. $k(x) = 3x + 4$ over the interval [4, 6].

4. $g(x) = 0.5^x$ over the interval [-1, 0].

5. $g(x) = 0.5^x$ over the interval [-3, 0].

WORD PROBLEMS

1. The table shows the cost per pound of Granny smith apples.

Describe the rates of change show by the data.

Weight (lb)	1	2	3	4
Cost ($)	1.49	2.98	4.47	5.96

Describe the rate(s) of change shown by the data.

_____

_____

2. The table shows Gabe's height on his birthday for five years.

Age	9	11	12	13	15
Height (in)	58	59.5	61.5	65	69

Find the rate of change during each time interval.

9 – 11 years:

11 – 12 years:

12 – 13 years:

13 – 15 years:

Describe the rates of change shown by the data.

_____

_____

When did the greatest rate of change occur?

_____

When was the rate of change the least?

_____

During which two time periods were the rates of change the same?

_____

3. The table shows the distance of a courier from her destination.

Time (PM)	2:15	2:30	2:45	3:00
Distance (miles)	5.4	5.4	5.0	0.5

What is the rate of change from 2:15 PM to 2:30 PM? What does this rate of change mean?

_____

_____

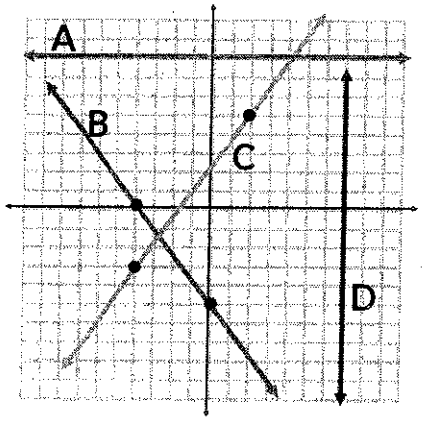
Algebra 1

Name_____

Characteristics of Linear Functions

Date_____

Warm-up: Find the rate of change.



1. Line A m = _____
2. Line B m = _____
3. Line C m = _____
4. Line D m = _____

What if you don't have a graph?

$$m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$$

5. (1, 4) (6, 2)

6. (2, –3) (4, 3)

Characteristics of Linear Functions

_____ - the slope of a function

_____ - the set of x-values for a function

_____ - the set of y-values for a function

_____ - the interval where the graph rises and the y-values increase

_____ - the interval where the graph falls and the y-values decrease

_____ - the point(s) where a graph crosses the x-axis

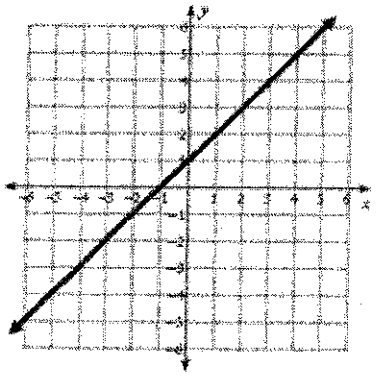
_____ - the point(s) where a graph crosses the y-axis

_____ - the behavior at the end of the graph (up or down) as x approaches negative infinity (left) or positive infinity (right).

Note: A continuous linear function will always have a domain and range that include all real numbers.

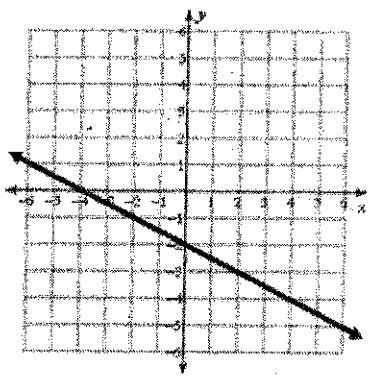
Rate of Change: the slope of a function. Find the rate of change for each function below.

1.



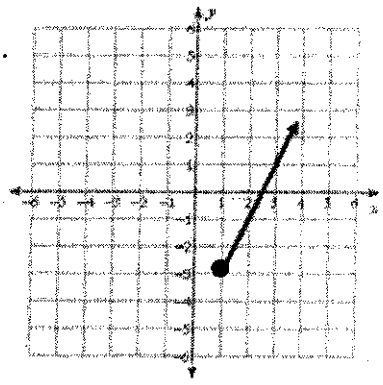
Rate of Change: _____

2.



Rate of Change: _____

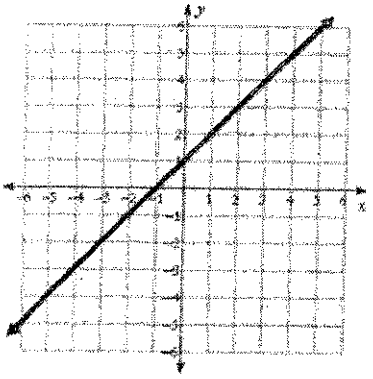
3.



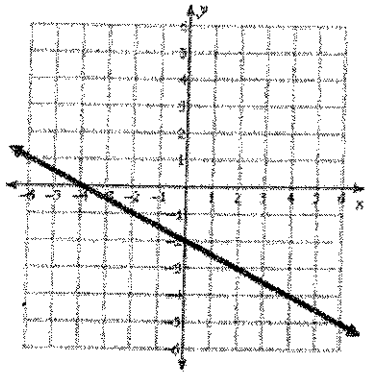
Rate of Change: _____

11

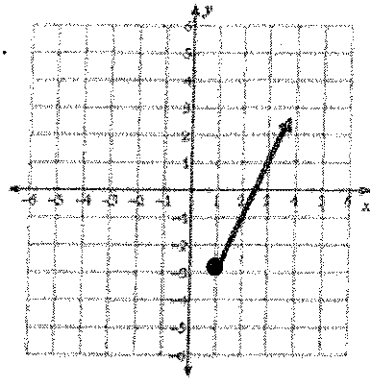
Domain: the set of x-values. **Range**: the set of y-values. Find the domain and range for each function below. Write the domain and range in inequality notation.

1. 

Domain: _____
Range: _____

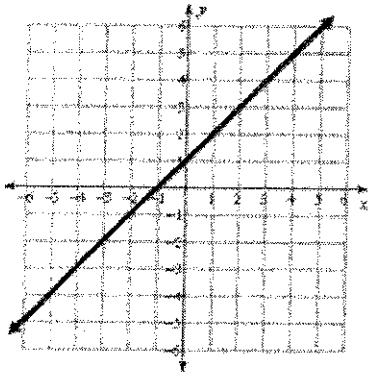
2. 

Domain: _____
Range: _____

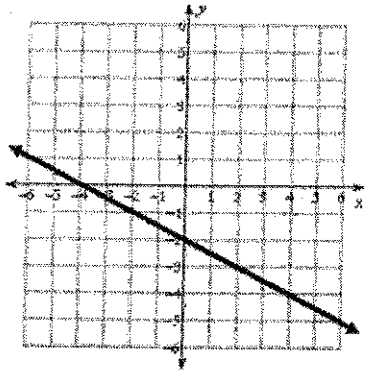
3. 

Domain: _____
Range: _____

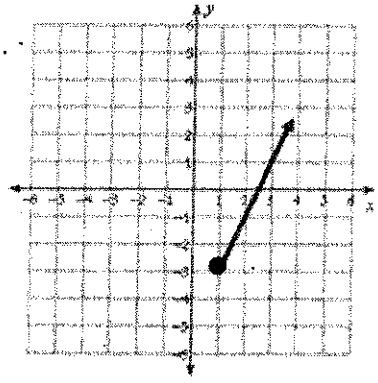
Increasing Interval: the interval where the graph rises and the y– values increase. **Decreasing Interval**: the interval where the graph falls and the y – values decrease. (The intervals should be written in inequality notation, and are written in terms of x). Find the intervals of increase and decrease for each function below.

1. 

Increasing Interval: _____
Decreasing Interval: _____

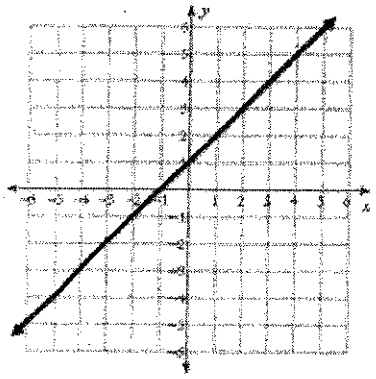
2. 

Increasing Interval: _____
Decreasing Interval: _____

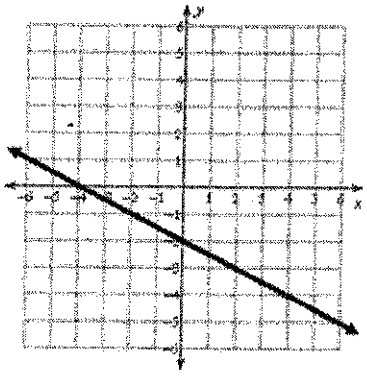
3. 

Increasing Interval: _____
Decreasing Interval: _____

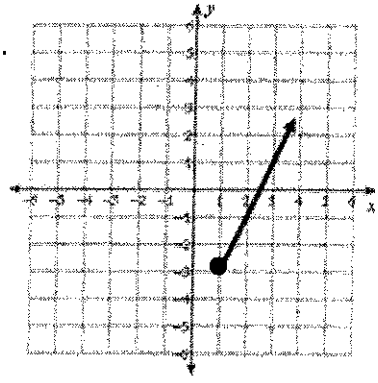
X-Intercept: the point(s) where a graph crosses the x-axis. **Y-Intercept**: the point where a graph crosses the y-axis. Find the x-intercept (s) and y-intercepts of each function below.

1. 

x – intercept(s): _____
y – intercept: _____

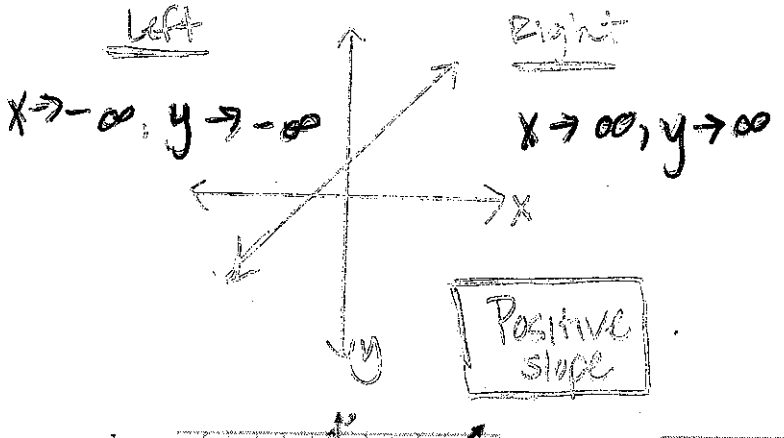
2. 

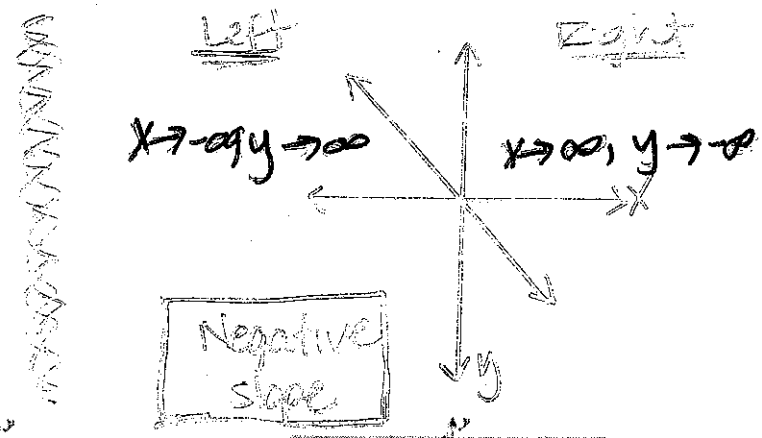
x – intercept(s): _____
y – intercept: _____

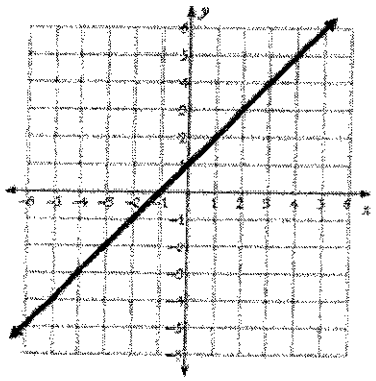
3. 

x – intercept(s): _____
y – intercept: _____

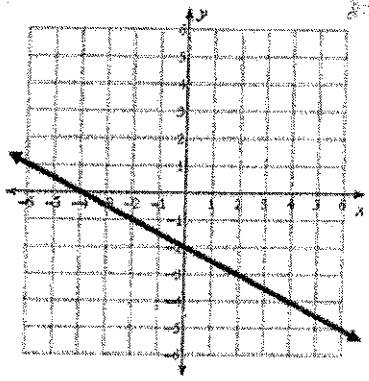
End Behavior: the behavior at the end of the graph (up or down) as x approaches negative infinity (left) or positive infinity (right). Find the left and right end behavior of each function below.



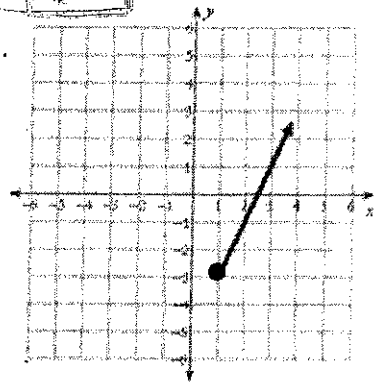


1. 

Left End Behavior: _____
Right End Behavior: _____

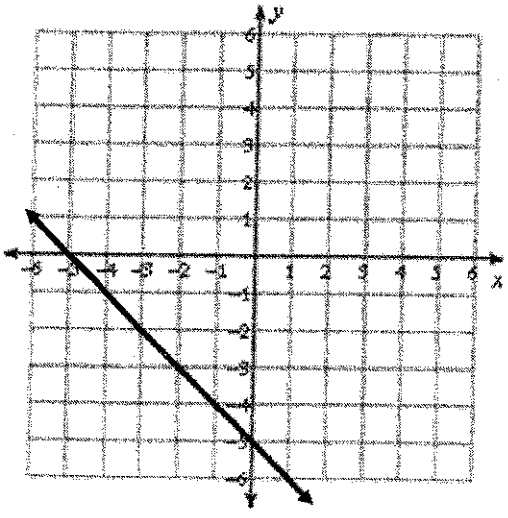
2. 

Left End Behavior: _____
Right End Behavior: _____

3. 

Left End Behavior: _____
Right End Behavior: _____

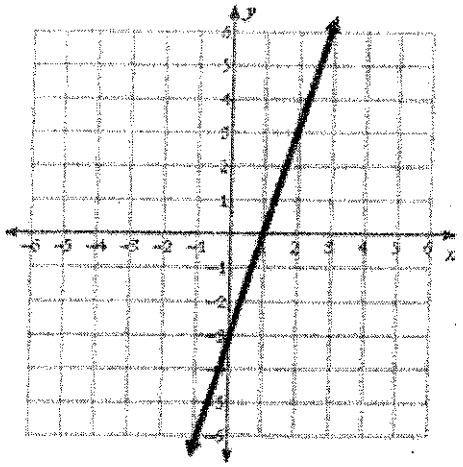
Put it all together!



Characteristic	Answer
Rate of Change	
Domain	
Range	
Increasing Interval	
Decreasing Interval	
x-intercept	
y-intercept	
Left End Behavior	
Right End Behavior	

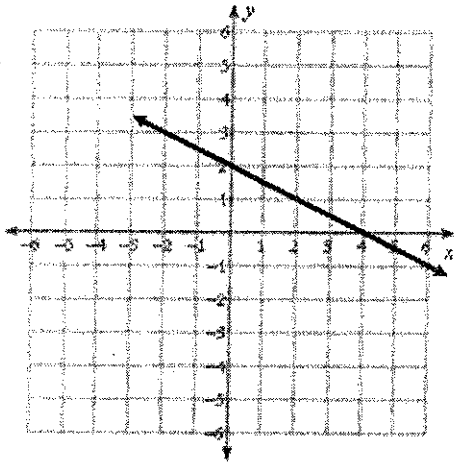
Classwork/Homework: Fill in the characteristics table for each function below.

1.



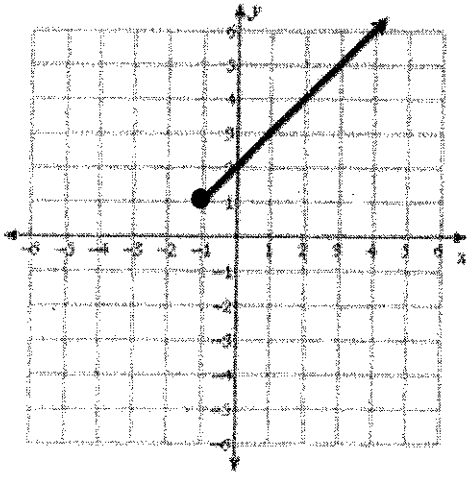
Characteristic	Answer
Rate of Change	
Domain	
Range	
Increasing Interval	
Decreasing Interval	
x-intercept	
y-intercept	
Left End Behavior	
Right End Behavior	

2.



Characteristic	Answer
Rate of Change	
Domain	
Range	
Increasing Interval	
Decreasing Interval	
x-intercept	
y-intercept	
Left End Behavior	
Right End Behavior	

3.



Characteristic	Answer
Rate of Change	
Domain	
Range	
Increasing Interval	
Decreasing Interval	
x-intercept	
y-intercept	
Left End Behavior	As x → -
Right End Behavior	

Characteristics of Linear Functions Practice Worksheet A

Name_____ Date_____

1. Domain: _____ Range: _____

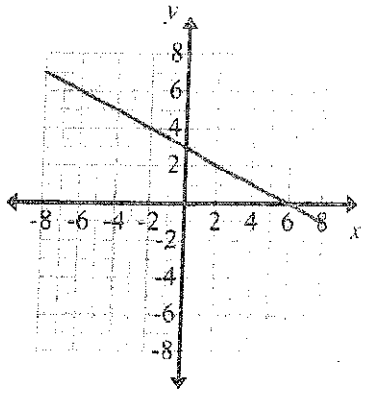
x – intercept: _____ y – intercept: _____

Increasing: _____ Decreasing: _____

Constant:_____ Slope:_____

End Behavior: As $x \to +\infty$, $f(x) \to$ _____

As $x \to -\infty$, $f(x) \to$ _____



Equation:_____

---

2. Domain: _____ Range: _____

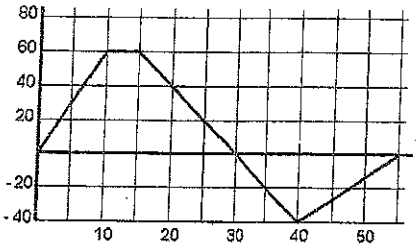
x – intercept: _____ y – intercept: _____

Increasing: _____ Decreasing: _____

Constant:_____ Slope:_____

End Behavior: As $x \to +\infty$, $f(x) \to$ _____

As $x \to -\infty$, $f(x) \to$ _____



---

3. Domain: _____ Range: _____

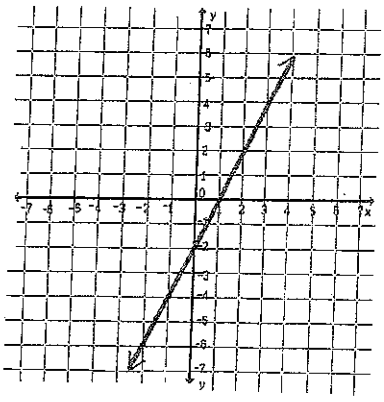
x – intercept: _____ y – intercept: _____

Increasing: _____ Decreasing: _____

Constant:_____ Slope:_____

End Behavior: As $x \to +\infty$, $f(x) \to$ _____

As $x \to -\infty$, $f(x) \to$ _____



Equation: _____

COAL

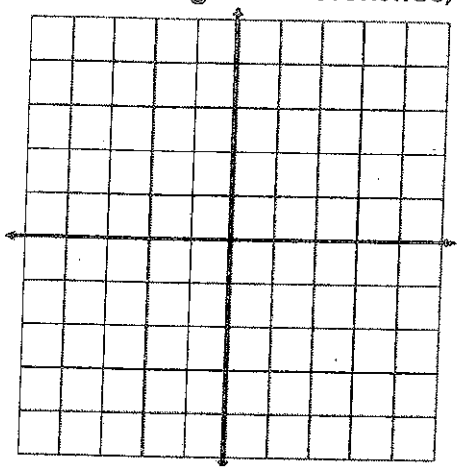
Name_____

Homework – Characteristics of Linear Functions Day 2

Date_____

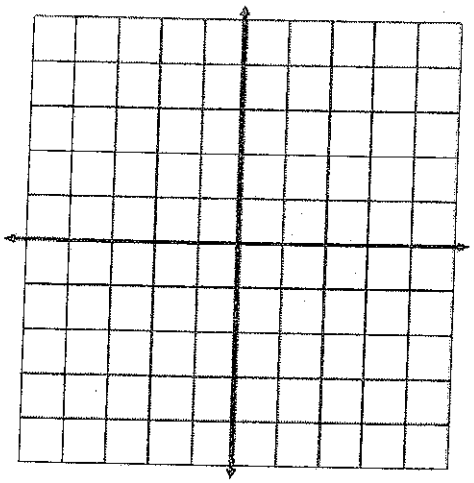
Given the following characteristics, sketch and complete the table.

1.



Characteristic	Answer
Rate of Change	1/2
Domain	
Range	
Increasing Interval	
Decreasing Interval	
x-intercept	(-2, 0)
y-intercept	
Left End Behavior	
Right End Behavior	
f(x) =	

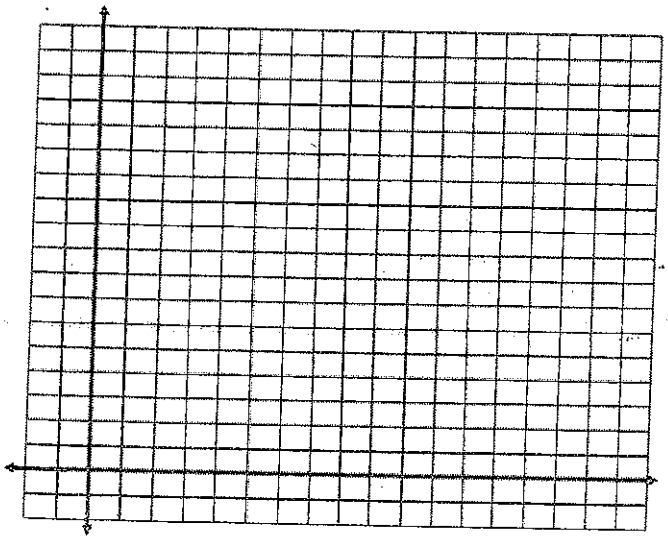
2.



Characteristic	Answer
Rate of Change	
Domain	
Range	
Increasing Interval	
Decreasing Interval	
x-intercept	(2, 0)
y-intercept	(0, 2)
Left End Behavior	
Right End Behavior	
f(x) =	

3. Arvy only as $11 in his wallet. He must pay $3 for a cab ride and $.50 per mile. Partial miles are charged accordingly. Write and graph a function for his cost.

C(x) = _____



Characteristic	Answer
Rate of Change	
Domain	
Range	
Increasing Interval	
Decreasing Interval	
x-intercept	
y-intercept	
Left End Behavior	
Right End Behavior	

Arithmetic Sequences
Guided Notes

Name: _____

Date: _____

Learning Targets

I can use the arithmetic sequence formula to find the nth term.
I can write an arithmetic sequence equation to represent an arithmetic sequence.
I can graph an arithmetic sequence function.

- ✓ **Sequence** – a set of numbers in a specific order
- ✓ **Terms of the sequnce** – each number (1st term – 1st number on a list, 2nd term = 2nd number, and so on)
- ✓ **Arithmetic Sequence** – add or subtract the same number each time (common difference)

Ex) 3, 5, 7, 9, 11, ... Or 33, 29, 25, 21, 17, ...

Two formulas to represent arithmetic sequences: Recursive and Explicit

Definition of Arithmetic Sequence

- An *arithmetic sequence* is a sequence of numbers in which the difference between each term is **constant**.
- There is an **explicit** formula we can use to work with arithmetic sequences:

$$a_n = a_1 + (n-1)d$$

nth term | *1st term* | *Term Number* | *Difference between terms*

What does a_n represent?

Given the sequence $-8, -5, -2, 1, 4, 7, 10, 13, 16, \ldots$

- a_n represents the **nth** term. ***"n" depends on what term you are looking for.***
- For example, in this sequence, $a_3 = -2$ because -2 is the **3rd** term. Likewise, $a_7 = 10$.

Example: Find the 28th term of the sequence 3, 5, 7, 9, ...

$a_1 = 1st\ term = \mathbf{3}$
$d = common\ difference = \mathbf{2}$
$n = term\ \# = \mathbf{28}$
$a_{28} = ?$

$a_{28} = 3 + (28-1)(2)$
$a_{28} = 3 + (27)(2)$
$a_{28} = 3 + 54$
$a_{28} = \mathbf{57}$

Recursive Formula: $a_n = a_{n-1} + d$ **Formula is used to find next term given the previous term.**

Example: $a_n = a_{n-1} + 2$ **for 2, 4, 6, 8, ____, ____, ____ ...**

Write the recursive formula for the given sequences:

a.) 3, 9, 15, 21... _____

b.) -2, -5, -8, -11... _____

Examples (identifying arithmetic sequences)

Determine whether the following sequence are arithmetic or not. Remember, arithmetic sequences have a **constant** difference.

a) $-4, -2, 0, 2, \ldots$

b) $9, 4, -1, \ldots$

c) $\frac{1}{2}, \frac{3}{4}, 1, \frac{5}{4}, \ldots$

d) $\frac{1}{2}, \frac{5}{8}, \frac{3}{4}, \frac{13}{16}, \ldots$

Examples (continuing sequences)

Determine the common difference for each sequence and fill in the next three terms.

a) $15, 9, 3, -3, \ldots$

b) $\frac{1}{4}, \frac{3}{4}, \frac{5}{4}, \frac{7}{4}, \ldots$

c) $\frac{2}{3}, \frac{5}{6}, 1, \ldots$

____, ____, ____ ____, ____, ____, ____, ____, ____

Examples (finding the nth term):

Find the given term for each sequence.

a) Sequence: $0, 4, 8, 12, \ldots$
Find the 18th term.

b) Sequence: $9, 3, -3, \ldots$
Find the 75th term.

c) $\frac{1}{3}, \frac{1}{2}, \frac{2}{3}, \ldots$
Find the 40th term.

HW day 1

Algebra I [redacted] Name_____

Practice Worksheet: Writing Explicit Formulas For Arithmetic Sequences

State the common difference. Find the next 3 terms.

1) −18, −26, −34, −42, ...

2) 22, 28, 34, 40, ...

3) 16, 26, 36, 46, ...

4) 22, 13, 4, −5, ...

5) 3, 33, 63, 93, ...

6) 5, −4, −13, −22, ...

Find the common difference. Write the closed explicit formula. Use your formula to find the value of the term given.

7) 26, −74, −174, −274, ...
Find a_{31}

8) −12, −2, 8, 18, ...
Find a_{26}

9) −8, −208, −408, −608, ...
Find a_{34}

10) 7, 17, 27, 37, ...
Find a_{29}

11) 33, 233, 433, 633, ...
Find a_{32}

12) 37, 7, −23, −53, ...
Find a_{25}

Notes Continued

Examples (finding other things with the arithmetic sequence formula):

Use the arithmetic sequence formula to solve each problem.

a) A sequence's 80th term is 293 and its common difference is 3. Find the first term.

b) A sequence's first term is -6 and its 21st term is 634. Find the common difference.

Examples (writing a functions and graphing):

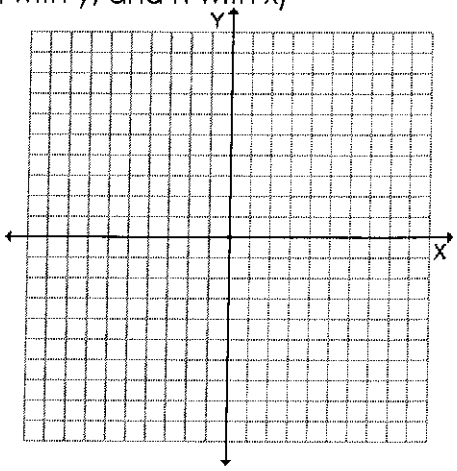
Given the arithmetic sequence, write a function and use it to create a table and graph.

a) Arithmetic sequence: $-12, -8, -4, 0, \ldots$

i) Write an equation for the arithmetic sequence and simplify.

ii) Graph the equation using a table. (Hint: Replace a_n with y, and n with x)

X					
y					

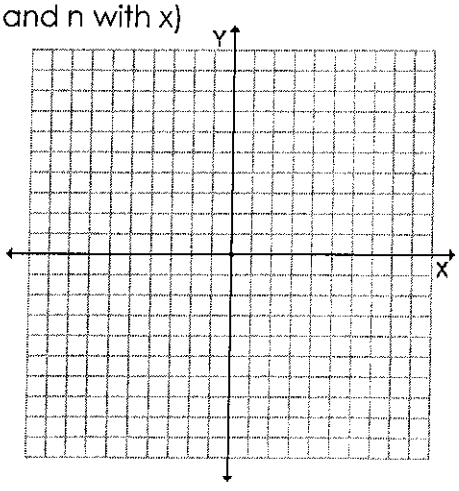


b) Arithmetic sequence: $-19, -13, -7, -1, \ldots$

i) Write an equation for the arithmetic sequence and simplify.

ii) Graph the equation using a table. (Hint: Replace a_n with y, and n with x)

X					
y					



Section 3.5: Arithmetic Sequences
Practice Worksheet
Honors Algebra I

Day 2 HW

Name: _____

Date: _____

Determine whether each sequences is an arithmetic sequence.

1. $0, 2, 5, 9, 14, \ldots$

2. $37, 34, 31, 28, \ldots$

3. $-\frac{1}{3}, -\frac{17}{6}, -\frac{16}{3}, \ldots$

Find the next three terms of each arithmetic sequence.

4. $10, 13, 16, 19, \ldots$

_____, _____, _____

5. $-14, -19, -24, \ldots$

_____, _____, _____

6. $\frac{3}{5}, \frac{7}{10}, \frac{4}{5}, \ldots$

_____, _____, _____

Determine the explicit formula and find the term indicated.

7. $3, 7, 11, 15, \ldots$

_____
38th term

8. $-5, -7, -9, \ldots$

_____
71st term

9. $\frac{2}{9}, \frac{5}{9}, \frac{8}{9}, \ldots$

_____
24th term

⋆10. An arithmetic sequence has a common difference of -4 and its 37th term is 10. Find the first term.

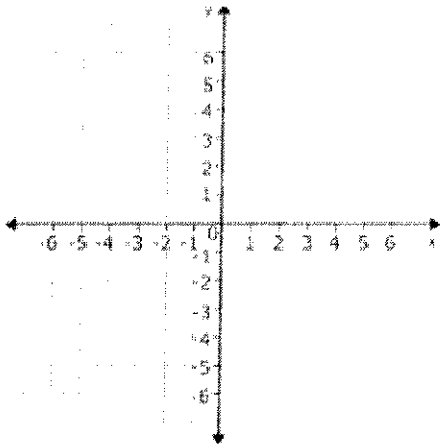
⋆11. How many total terms are there in the following sequence? (challenge)

$7, 10, 13, \ldots, 391, 394$

⋆13. Write an equation in terms of y and x to represent the sequence $4, 8, 12, \ldots$
(Hint: Use the arithmetic sequence formula, then replace a_n with y and n with x).

a_1 =_____

d = _____



Explicit Formula:_____

Slope intercept form of equation: _____

14. Zariah's 100 meter dash times for her first four races were 14 seconds, 13.4 seconds, 12.8 seconds, and 12.2 seconds.

i) Assuming race times will decrease at the same rate. Write an equation for the arithmetic sequence (Hint: find a_1 and d first.)

ii) What will the time for her 12th race be?

⋆iii) When will she have a time of 11 seconds for the 100 meter dash?

Extra Practice

Algebra 1
Arithmetic Sequences

Name: _____
Date: _____

Write the explicit and recursive formula for the sequence. Then name the next four terms.

1. 5, 9, 13, …

2. 2, -3, -8,…

3. $\frac{1}{2}, \frac{3}{2}, \frac{5}{2}, \ldots$

Find the nth term of each arithmetic sequence.

$a_1 = -1,\ d = -10,\ n = 25$

$a_1 = -7,\ d = 3,\ n = 17$

Complete each statement.

124 is the _____th term of –2, 5, 12, …

–28 is the _____th term of 7, 2, -3, …

Find the indicated term in each sequence.

a_{12} for –17, -13, -9, …

a_{10} for 8, 3, -2, …

Find the missing term in each sequence.

-10, ____, ____, ____, 2

____, 49, ____, ____, 28

Fill in the table given the following recursive formulas.

$a_1 = -21$; $a_n = a_{n-1} + 9$

Domain: _____

Range: _____

Term Number (n)						
Value (a_n)						

Find the explicit formula and the recursive formula for the following sequences.

	Explicit Formula	Recursive Formula
−40, −36, −32, −28, ...		
−31, 69, 169, 269, ...		
−24, −15, −6, 3, ...		
31, 11, −9, −29, ...		
−16, −23, −30, −37, ...		