Warm-Up 12-3

Good Morning!

Take a moment to write down some things that you are thankful for and fun things that you did from break. Then do the warm-up below what you write.

Determine if the following sequences are linear, exponential or neither.

1. 6, 9, 13, 18, 24, ...

2. 3, 9, 27, 81, ...

3. 29, 35, 41, 47, ...

4. -5, 10, -20, 40, -80, ...

Warm-Up 12-2

Determine if the following sequences are linear, exponential or neither.

1. 6, 9, 13, 18, 24, ...

+3 +4 +5 +6

Neither

2. 3, 9, 27, 81, ...

×3

exponential

3. 29, 35, 41, 47, ...

+6 +6 +6

Linear

4. -5, 10, -20, 40, -80, ...

×-2

exponential

An **arithmetic sequence** has a constant difference between each term. (Linear Function)

For example: 2, 4, 6, 8,10,12,…

We can see clearly that all the terms differ by +2.

We call this the common difference, d.

A **geometric sequence** has a constant ratio (multiplier) between each term. (Exponential Function)

An example is: 2, 4, 8, 16, 32,…

So to find the next term in the sequence we would multiply the previous term by 2.

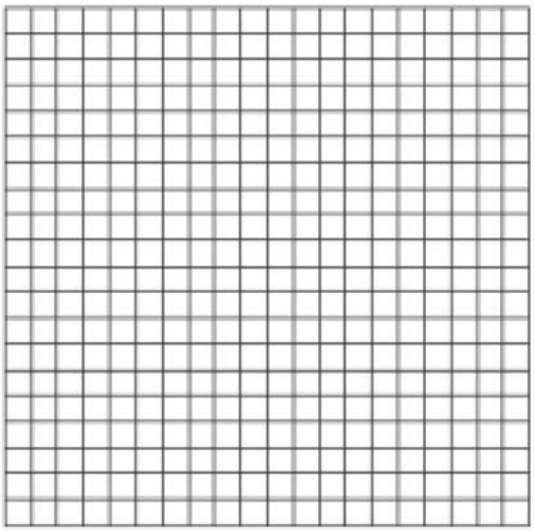
This is called the common ratio, r.

UNIT 6 – EXPONENTIAL FUNCTIONS
Linear vs. Exponential Functions (Day 1)

Complete these tables below, graph each set of points.

1.

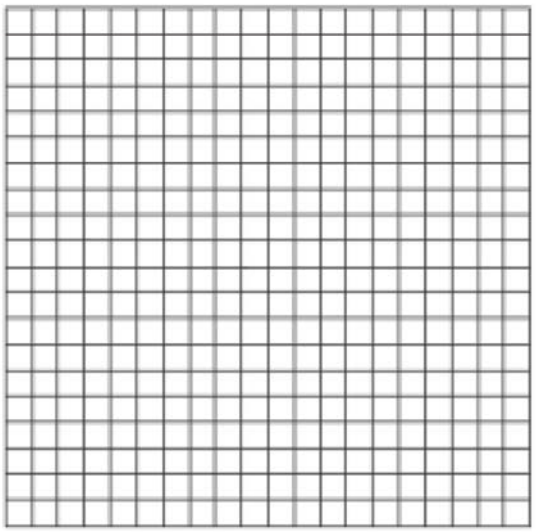
x	f(x)
0	-5
1	2
2	9
3	16
4	23
5	



Key Components

2.

x	f(x)
0	1
1	2
2	4
3	8
4	



Key Components

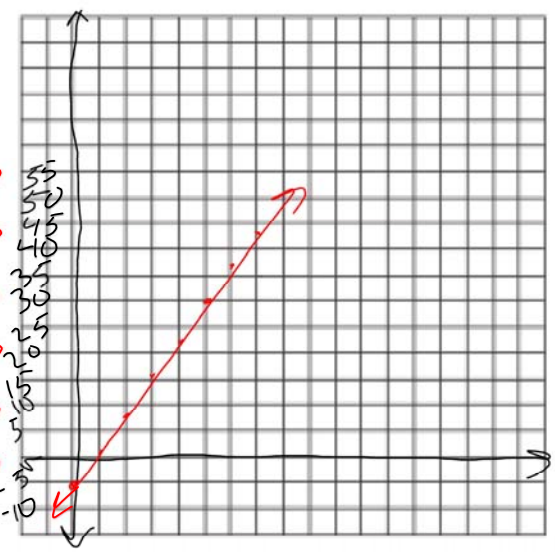
UNIT 6 – EXPONENTIAL FUNCTIONS
Linear vs. Exponential Functions (Day 1)

Complete these tables below, graph each set of points.

1.

x	f(x)
0	-5
1	2
2	9
3	16
4	23
5	30
6	37
7	44

+7 +7 +7 +7 +7 +7 +7



Key Components

Linear

Increasing

Slope: +7

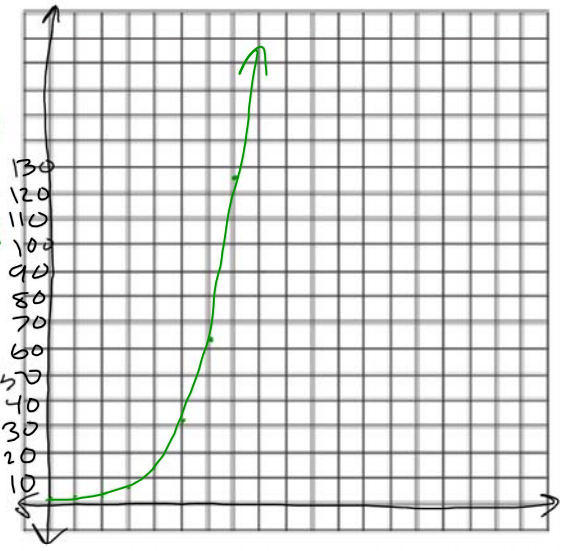
y-int: -5

common difference: +7

2.

x	f(x)
0	1
1	2
2	4
3	8
4	16
5	32
6	64
7	128

×2 ×2 ×2 ×2 ×2 ×2 ×2



Key Components

Exponential

Increasing

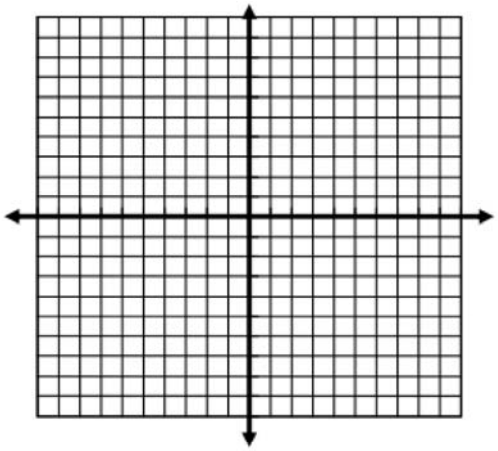
y-int: 1

common ratio: 2

Linear Functions	Table Pattern shows _____ or _____ by same number: **This is pattern is called a** _____ _____ Rate of Change is _____ between intervals
Exponential Functions	Table Pattern shows _____ or _____ by same number: **This is pattern is called a** _____ _____ Rate of Change is _____ between intervals

3. Use the function $g(x) = 2x - 3$ to fill in the table below and graph.

x	g(x)
-3	-9
-2	-7
-1	-5
0	
1	
2	
3	



a) What type of function is this and why?

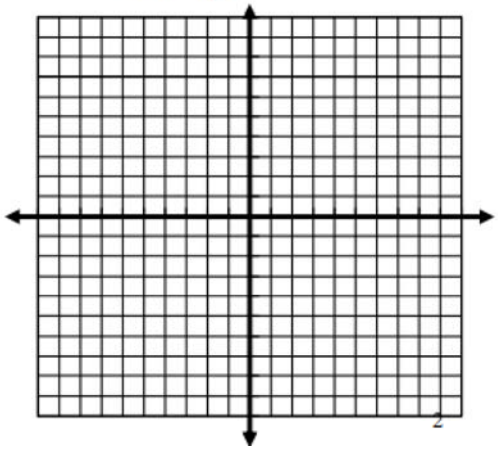
b) What is the domain?

c) What is the range?

d) What is the rate of change?

4. Use the function $g(x) = (\frac{1}{2})^x$ to fill in the table below and graph.

x	g(x)
-3	8
-2	4
-1	2
0	1
1	½
2	¼
3	⅛



a) What type of function is this and why?

b) What is the domain?

c) What is the range?

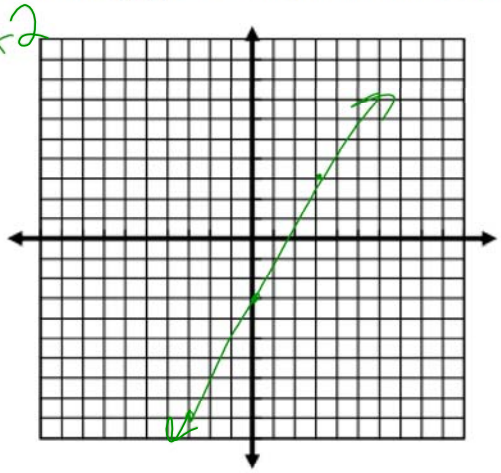
d) What is the rate of change?

Linear Functions	Table Pattern shows adding or subtracting by same number: **This is pattern is called a** common difference (d) Rate of Change is constant (the same) between intervals
Exponential Functions	Table Pattern shows multiplying or dividing by same number: **This is pattern is called a** common ratio (r) Rate of Change is changing (different) between intervals

3. Use the function g(x) = 2x – 3 to fill in the table below and graph.

x	g(x)
-3	-9
-2	-7
-1	-5
0	-3
1	-1
2	1
3	3

+2



a) What type of function is this and why?
Linear (constant rate of change)
(it is a line)

b) What is the domain?
$x \in \mathbb{R}$

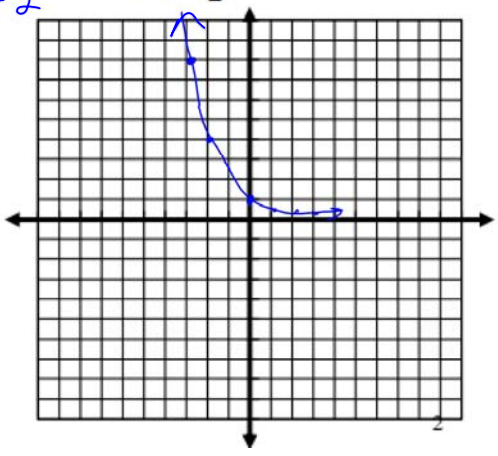
c) What is the range?
y is all Real #'s

d) What is the rate of change?
+2

4. Use the function $g(x) = (\frac{1}{2})^x$ to fill in the table below and graph.

x	g(x)
-3	8
-2	4
-1	2
0	1
1	$\frac{1}{2}$
2	$\frac{1}{4}$
3	$\frac{1}{8}$

÷2



a) What type of function is this and why?
Exponential
(÷2 each time)

b) What is the domain?
$(-\infty, \infty)$

c) What is the range?
$y > 0$

d) What is the rate of change?
changing

Recall Types of Functions and their key components:

_____ functions have a common _____. With a _____ rate of change
_____ functions have a common _____. With a _____ rate of change

1. After graduation, you are offered two jobs. Cedar Grove Associates offered to start you at $30,000 with a 6% increase per year. Maple Grove Associates offered to start you at $40,000 with a $1200 raise per year. Compare the two jobs offered by completing the table below. Answer the following questions?

Year	Cedar Grove	Maple Grove
1	$30,000	$40,000
2	31800	41,200
3	33708	42,400
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		

1800
1908

a) Cedar Grove models what type of function? Explain

*It has a common*_____ *of* _____

b) Maple Grove models what type of function? Explain

It has a common_____ of _____

c) If you plan on moving to a different state in 5 years which company would be the better option for you to choose? Explain.

d) If your plans change and you don't move, which company would be the better option to choose as a long term career? Explain

Recall Types of Functions and their key components:

Linear functions have a common difference. With a constant rate of change

Exponential functions have a common ratio. With a changing rate of change

1. After graduation, you are offered two jobs. Cedar Grove Associates offered to start you at \$30,000 with a 6% increase per year. Maple Grove Associates offered to start you at \$40,000 with a \$1200 raise per year. Compare the two jobs offered by completing the table below. Answer the following questions?

6% = 0.06

×1.06 +1800 +1906 +1200

Year	Cedar Grove	Maple Grove
1	\$30,000	\$40,000
2	31,800	41,200
3	33,708	42,400
4	35,730	43,600
5	37,874	44,800
6	40,147	46,000
7	42,556	47,200
8	45,109	48,400
9	47,815	49,600
10	50,684	50,800
11	53,725	52,000
12		
13		
14	63,988	55,600

a) Cedar Grove models what type of function? Explain

Exponential

It has a common ratio of 1.06

b) Maple Grove models what type of function? Explain

Linear

It has a common difference of 1200

c) If you plan on moving to a different state in 5 years which company would be the better option for you to choose? Explain.

Maple Grove

d) If your plans change and you don't move, which company would be the better option to choose as a long term career? Explain

Cedar Grove

2. **Given the situations below, identify if it is a linear or exponential model or neither. Explain your reasoning.**

   a. A savings account that starts with $5000 and receives a deposit of $825 per month.

   b. The value of a house that starts at $150,000 and increases by 1.5% per year.

   c. Tina owns 4 rabbits. She expects them to double each year.

   d. The cost of operating Jelly's Doughnuts is $1600 per week plus $.10 to make each doughnut.

   e. The value of John's car that depreciates 20% per year

   f. The height of a ball that is thrown in the air

3. Which situation could be modeled with an exponential function?

   (1) the amount of money in Suzy's piggy bank which she adds $10 to each week
   (2) the amount of money in a certificate of deposit that gets 4% interest each year
   (3) the amount of money in a savings account where $150 is deducted every month
   (4) the amount of money in Jaclyn's wallet which increases and decreases by a different amount each week

4. Which statement below is true about linear functions?
   (1) Linear functions grow by equal factors over equal intervals
   (2) Linear functions grow by equal differences over equal intervals
   (3) Linear functions grown by equal differences over unequal intervals
   (4) Linear functions grow by unequal factors over equal intervals

5. Given the tables below, classify them as a linear model, exponential model, or neither.

HOURS	MONEY
1	100
2	200
3	400
4	800
5	1600

HOURS	MONEY
1	100
2	200
3	300
4	200
5	100

HOURS	MONEY
1	100
2	250
3	400
4	550
5	700

2. **Given the situations below, identify if it is a linear or exponential model or neither. Explain your reasoning.**

a. A savings account that starts with $5000 and receives a deposit of $825 per month.

Linear: increase by a constant rate

b. The value of a house that starts at $150,000 and increases by 1.5% per year.

Exponential: multiplying each year (1.015)

c. Tina owns 4 rabbits. She expects them to double each year.

Exponential: doubles (x2) each year

d. The cost of operating Jelly's Doughnuts is $1600 per week plus $.10 to make each doughnut.

Linear: adding 0.1 each donut

e. The value of John's car that depreciates 20% per year

Exponential: multiplying (0.8)

f. The height of a ball that is thrown in the air

Neither

3. Which situation could be modeled with an exponential function?

(1) the amount of money in Suzy's piggy bank which she adds $10 to each week
(2) the amount of money in a certificate of deposit that gets 4% interest each year
(3) the amount of money in a savings account where $150 is deducted every month
(4) the amount of money in Jaclyn's wallet which increases and decreases by a different amount each week

4. Which statement below is true about linear functions? multiply
(1) Linear functions grow by equal factors over equal intervals
(2) Linear functions grow by equal differences over equal intervals
(3) Linear functions grown by equal differences over unequal intervals
(4) Linear functions grow by unequal factors over equal intervals

5. Given the tables below, classify them as a linear model, exponential model, or neither.

HOURS	MONEY
1	100
2	200
3	400
4	800
5	1600

x2

Exponential

HOURS	MONEY
1	100
2	200
3	300
4	200
5	100

Neither

HOURS	MONEY
1	100
2	250
3	400
4	550
5	700

+150

Linear

Homework

Linear vs. Exponential
worksheet