Warm-Up 1-10

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 1-10

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

Kuta Software - Infinite Algebra 2   Name_____

Comparing Arithmetic and Geometric Sequences   Date_____ Period____

For each sequence, state if it is arithmetic, geometric, or neither.

1) 1, 3, 6, 10, 15, ...

    Neither

3) 4, $\frac{13}{3}$, $\frac{14}{3}$, 5, $\frac{16}{3}$, ...

    ⅓ ⅓ ⅓ ⅓

    Arithmetic

    Linear

2) 40, 43, 46, 49, 52, ...

    Arithmetic

    Linear

4) −4, 12, −36, 108, −324, ...

    Geometric

    Exponential

5) 4, 16, 36, 64, 100, ...

    Neither

7) 1, 5, 25, 125, 625, ...

    Geometric

6) −29, −34, −39, −44, −49, ...

    Arithmetic

    Linear

8) 1, 4, 9, 16, 25, ...

    Neither

9) −34, −26, −18, −10, −2, ...

    Arithmetic

    Linear

10) 0, 3, 8, 15, 24, ...

    Neither

11) $a_n = -163 + 200n$

    Arithmetic

n	a_n	
0	−163	⟩ 200
1	47	⟩ 200
2	247	

12) $a_n = 16 + 3n$

    ✓

    Arithmetic

13) $a_n = -4 \cdot (-3)^{n-1}$

    Geometric

n	a_n
0	⁴⁄₃
1	−4
2	+12

14) $a_n = -\frac{3}{4} + \frac{3}{2}n$

    ✓

    Arithmetic

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.

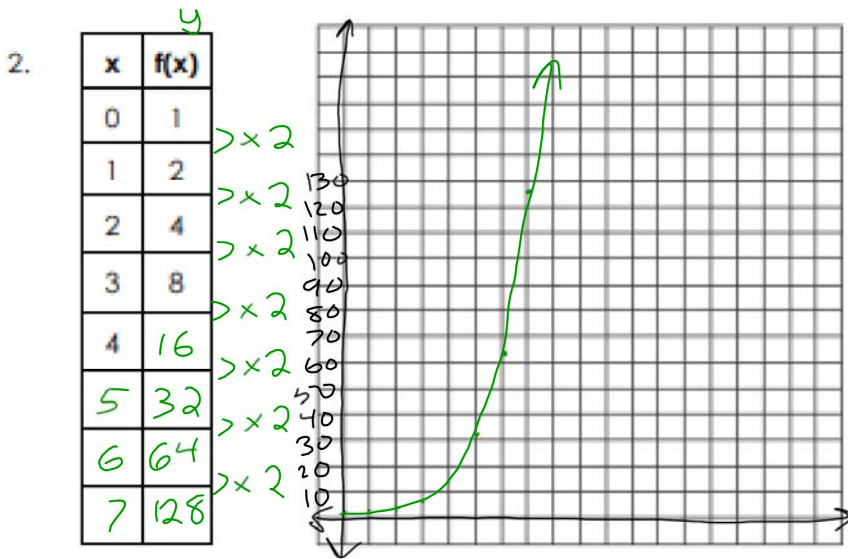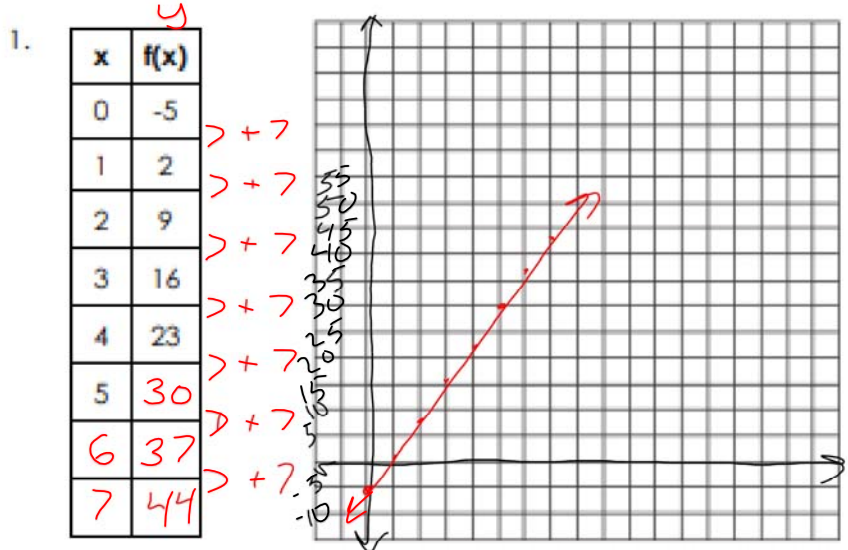A **geometric sequence** has a constant ratio (multiplier) between each term. (Exponential Function)

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	30
6	37
7	44

> +7
> +7
> +7
> +7
> +7
> +7
> +7

Key Components

Linear
Increasing
Slope: +7
y-int: -5

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

5

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_ between intervals _(the same)_
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_ between intervals _(different)_

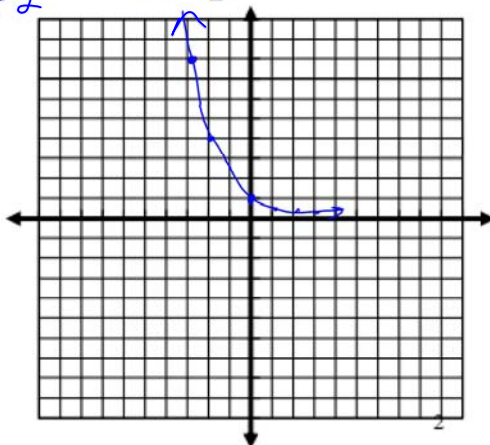3. Use the function g(x) = 2x − 3 to fill in the table below and graph.

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

+2
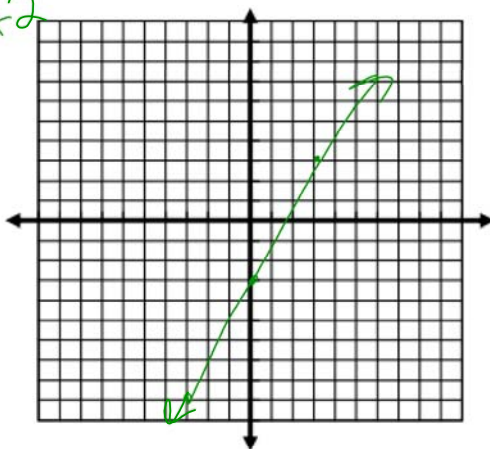
a) What type of function is this and why?
Linear (constant rate of chang)
(it is a line)

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.

÷2

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

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:

___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

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	67,827	55,600

+1800
+1908

+1200

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.

   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

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

   Exponential

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

   Linear

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

   Exponential

   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	×2
1	100	
2	200	
3	400	
4	800	
5	1600	

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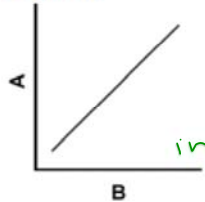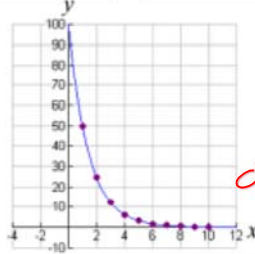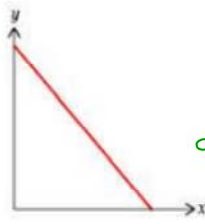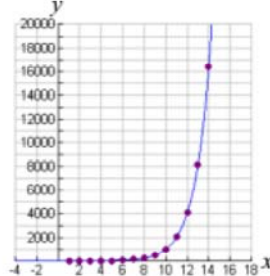
HOURS	MONEY
1	100
2	200
3	300
4	200
5	100

Neither

HOURS	MONEY	+150
1	100	
2	250	
3	400	
4	550	
5	700	

Linear

EXPLORING EXPONENTIAL FUNCTION
GROWTH & DECAY (DAY 3)

Linear Functions		Exponential Functions	
General Equation $y = ax + b$ $y = mx + b$	**Function Notation** $f(x) = ax + b$ $f(x) = mx + b$	**General Equation** $y = ab^x$	**Function Notation** $f(x) = ab^x$
		(recall: variable is the exponent for an exponential function)	

a = slope

b = y-intercept

a = initial value (starting amount)

b = rate of growth or decay

x = usually time

Exponential Function are able to have both a _positive_ or _negative_ rate of change

- Positive Rate of Change is called an _exponential_ _growth_

  To Get b# R.O.C: $(1 + r)$

- Negative Rate of Change is called an _exponential_ _decay_

  To Get b# R.O.C: $(1 - r)$

Graphs:

This is a graph of a _positive_ line (slope)

A

increasing from left to right

B

This is a graph of an exponential _decay_

decreasing from left to right

This is a graph of a _negative_ line (slope)

decreasing from left to right

This is a graph of an exponential _growth_

increasing from left to right

Project

Infectious Disease or Zombie Apocalypse

Homework

Linear vs. Exponential worksheet

Compare Linear and Exponential Functions

Name _____   Date _____

Sara has been asked to babysit for a neighbor. She is offered two payment options. With the first plan, she is paid $5.00 per hour. With the second plan, she is paid $0.25 for one hour, $0.50 for two hours, $1.00 for three hours, and so on, as shown in both the graph and the table.

Hours	Plan 1	Plan 2
1	5.00	0.25
2	10.00	0.50
3	15.00	1.00
4	20.00	2.00
5	25.00	4.00
6	30.00	8.00
7	35.00	16.00
8	40.00	32.00
9	45.00	64.00
10	50.00	128.00

1. What type of function is represented by Plan 1? _____

2. What type of function is represented by Plan 2? _____

3. How are the plans alike? Explain.

4. How are the plans different? Explain.

5. Sara asks you which plan she should choose if she was going to babysit for four hours. What would you tel her? Justify your answer.

6. When should Sara choose Plan 2? Why?