Warm-Up 4/10/17

One of these tables represents a linear relationship, one represents an exponential growth and one represents an exponential decay. Label each table correctly.

Linear

x	y
1	6
2	9
3	12
4	15

$d = 3$

$m = \frac{9-6}{2-1}$

$m = 3$

y-int = when $x = 0$, $y = 3$

Expo. decay

x	y
1	56
2	28
3	14
4	7

$r = \frac{a_2}{a_1}$

$= 28/56$

$= 0.5$

y-int = $(0, 112)$

Exp. growth.

x	y
1	6
2	9
3	13.5
4	20.25

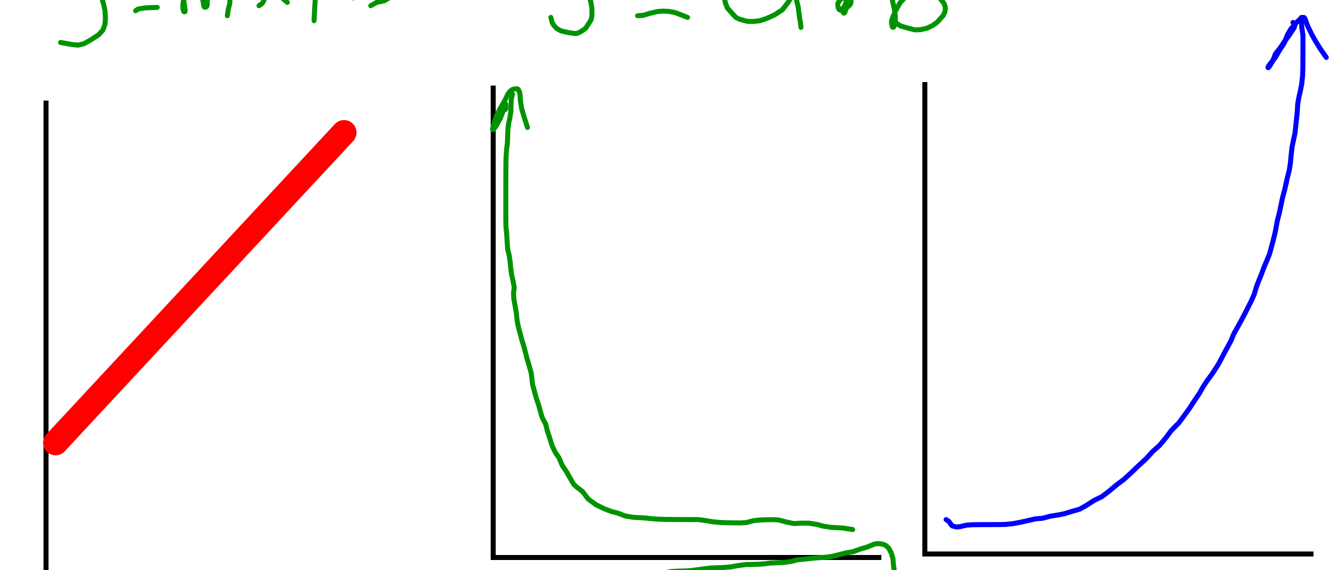
$r = \frac{9}{6} = 1.5$

y-int = $(0, 4)$

Warm-Up 4/10/17

2. Sketch the graphs of each relationship and write the equations that represent each.

$y = mx + b$ $y = a \cdot b^x$



$\boxed{y = 3x + 3}$ $\boxed{y = 112(0.5)^x}$ $\boxed{y = 4(1.5)^x}$

Learning Objectives 4/10/17

Compare and contrast linear, quadratic, and exponential functions and their characteristics.

Opening 4/10/17

- How is a linear function different from a quadratic function?
- How is a quadratic function different from an exponential function?

Glue in your INB 4/10/17

Identifying from an equation:

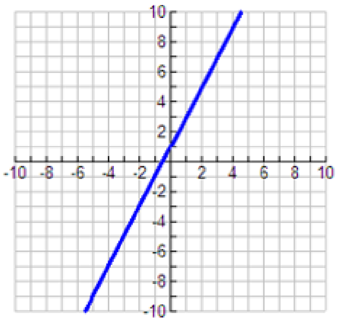
Linear	Quadratic	Exponential
	$y = x^2 - 3$	$y = 4^x - 2$
Has an x with no exponent.	Has an x^2 in the equation.	Has an x as the exponent.
$y = 3x + 2$		
$y = 5x + 1$	$y = 2x^2 + 3x - 5$	$y = 3^x + 1$
$y = ½x$	$y = x^2 + 9$	$y = 5^{2x}$
$2x + 3y = 6$	$x^2 + 4y = 7$	$4^x + y = 13$

Identifying from a graph:

Linear

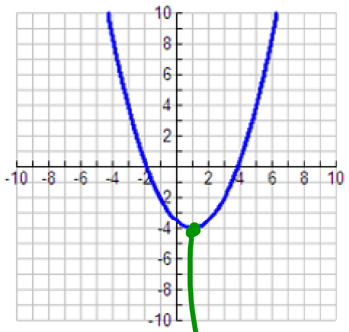
Makes a straight line

positive slope



Quadratic

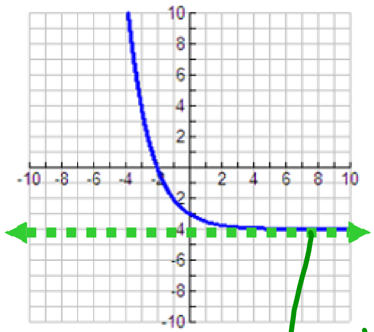
Makes a U or ∩



Minimum

Exponential

Rises or falls quickly in one direction



Asymptote

Identifying from a Table

Linear

- Never see the same y value twice.
- 1^{st} difference is the same

x	−2	−1	0	1	2
y	−2	1	4	7	10

Differences: 3 3 3 3

Common difference

Quadratic

- See same y more than once.
- 2^{nd} difference is the same

a.

x	−2	−1	0	1	2
y	−6	−6	−4	0	6

First differences: 0 2 4 6

Second differences: 2 2 2

Common 2^{nd} difference.

Exponential

- y changes more quickly than x.
- Never see the same y value twice.
- Common multiplication pattern

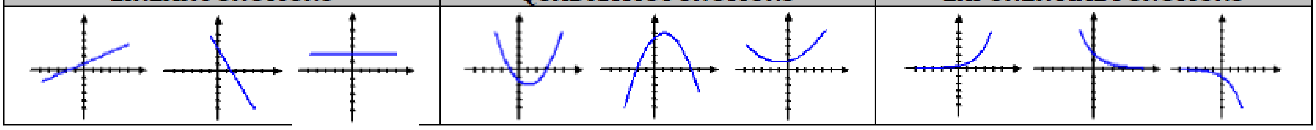
Common ratio.

Class Work 4/10/17

Work with your table partner to complete this.

GRAPHICAL EXAMPLES

LINEAR FUNCTIONS	QUADRATIC FUNCTIONS	EXPONENTIAL FUNCTIONS



1. Graphically identify which type of function model might best represent each scatter plot.

Model (circle one): Linear Quadratic Exponential	*Model (circle one):* Linear Quadratic Exponential	*Model (circle one):* Linear Quadratic Exponential	*Model (circle one):* Linear Quadratic Exponential	*Model (circle one):* Linear Quadratic Exponential

2. Match each graph with its description.

f I. An **exponential** function that is always **increasing**.

c II. An **exponential** function that is always **decreasing**.

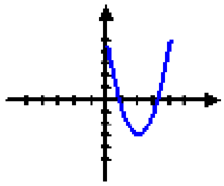
e III. A **quadratic** function with a **local maximum**.

a IV. A **quadratic** function with a **local minimum**.

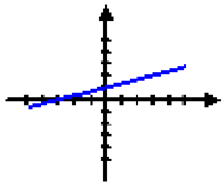
b V. A **linear** function that is always **increasing**.

d VI. A **linear** function that is always **decreasing**.

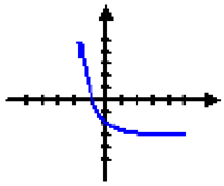
a.



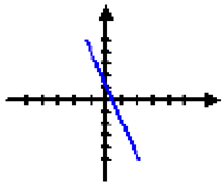
b.



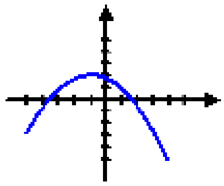
c.



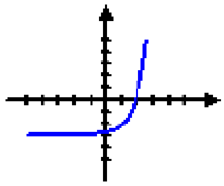
d.



e.



f.



3. Which is the only type of function below that has an asymptote when graphed?

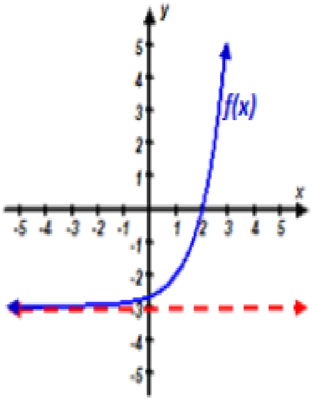
A. Linear Function B. Quadratic Function C. Exponential Function

4. Which is the only type of function below that could have a local maximum?

A. Linear Function B. Quadratic Function C. Exponential Function

5. Describe the end behavior of each of the function below.

A.

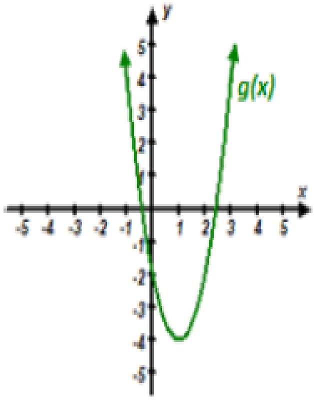


Name: exponential

left As $x \to -\infty$, $f(x) \to$ -3

right As $x \to \infty$, $f(x) \to$ ∞

B.

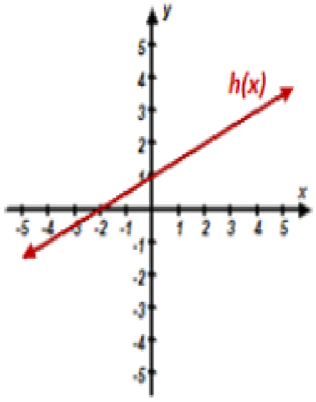


Name: Quadratic

As $x \to -\infty$, $g(x) \to$ ∞

As $x \to \infty$, $g(x) \to$ ∞

C.



Name: linear

As $x \to -\infty$, $h(x) \to$ $-\infty$

As $x \to \infty$, $h(x) \to$ ∞

6. Which is the only function that might have end behavior such that as ***x*** approaches infinity, ***f(x)*** approaches 4?

   A. Linear Function B. Quadratic Function C. Exponential Function

7. Which is the only function below that might have end behavior such that:
   - As $x \to -\infty$, $f(x) \to \infty$
   - As $x \to \infty$, $f(x) \to \infty$

   A. Linear Function B. Quadratic Function C. Exponential Function

8. Which is the only function below that might have end behavior such that:
   - As $x \to -\infty$, $f(x) \to -\infty$
   - As $x \to \infty$, $f(x) \to \infty$

   A. Linear Function B. Quadratic Function C. Exponential Function

9. Which is the only function below that might have end behavior such that:
   - As $x \to -\infty$, $f(x) \to -\infty$
   - As $x \to \infty$, $f(x) \to -\infty$

   A. Linear Function B. Quadratic Function C. Exponential Function

10. Based on the function given identify which description best fits the function.

A. $f(x) = x(2x+3)$

$f(x) = 2x^2 + 3x$

Model (circle one):

Linear Growth	Quadratic (Local Max)	Exponential Growth
Linear Decay	Quadratic (Local Min)	Exponential Decay

B. $g(x) = 3(1-2x) - 4$

$G(x) = 3 - 6x - 4$

$-6x - 1$

Model (circle one):

Linear Growth	Quadratic (Local Max)	Exponential Growth
Linear Decay	Quadratic (Local Min)	Exponential Decay

C. $h(x) = 2 + \left(\frac{1}{2}\right)^x$

Model (circle one):

Linear Growth	Quadratic (Local Max)	Exponential Growth
Linear Decay	Quadratic (Local Min)	Exponential Decay

D. $m(x) = 3 \cdot (2)^x + 1$

$a = 3$ $k = 1$

$b = 2$

Model (circle one):

Linear Growth	Quadratic (Local Max)	Exponential Growth
Linear Decay	Quadratic (Local Min)	Exponential Decay

E. $p(x) = 2 - 3x^2 + x$

$-3x^2 + x + 2$

Model (circle one):

Linear Growth	Quadratic (Local Max)	Exponential Growth
Linear Decay	Quadratic (Local Min)	Exponential Decay

F. $q(x) = \frac{1}{2}x - 1$

Model (circle one):

Linear Growth	Quadratic (Local Max)	Exponential Growth
Linear Decay	Quadratic (Local Min)	Exponential Decay

11. Based on the partial set of values given for a function, identify which description best fits the function.

x	0	1	2	3	4
$a(x)$	1	5	9	13	17

+4 +4

aritmetic

Model (circle one):

Linear Growth | Quadratic (Local Max) | Exponential Growth

Linear Decay | Quadratic (Local Min) | Exponential Decay

x	1	2	3	4	5
$b(x)$	1	2	1	-2	-7

1 -1 -3 -5

-2 -2 -2

Model (circle one):

Linear Growth | Quadratic (Local Max) | Exponential Growth

Linear Decay | Quadratic (Local Min) | Exponential Decay

x	1	2	3	4	5
$c(x)$	0	2	6	14	30

2 4 8 16

Model (circle one):

Linear Growth | Quadratic (Local Max) | Exponential Growth

Linear Decay | Quadratic (Local Min) | Exponential Decay

x	0	1	2	3	4
$d(x)$	3	0	-1	0	3

−3 −1 1 3

2 2 2

Model (circle one):

Linear Growth | Quadratic (Local Max) | Exponential Growth

Linear Decay | Quadratic (Local Min) | Exponential Decay

x	1	2	3	4	5
$e(x)$	65	33	17	9	5

−32 −16 −8 −4

Model (circle one):

Linear Growth | Quadratic (Local Max) | Exponential Growth

Linear Decay | Quadratic (Local Min) | Exponential Decay

x	1	2	3	4	5
$f(x)$	9	7	5	3	1

−2 −2 −2 −2

Model (circle one):

Linear Growth | Quadratic (Local Max) | Exponential Growth

Linear Decay | Quadratic (Local Min) | Exponential Decay

Closing: 4/10/17

1. Exit Ticket: Identify the following 6 functions as linear, quadratic, or exponential.

2. Interactive questions.