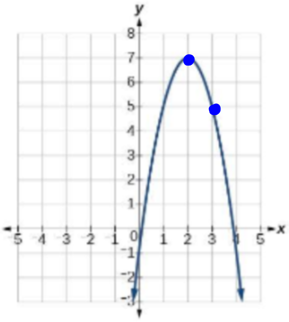
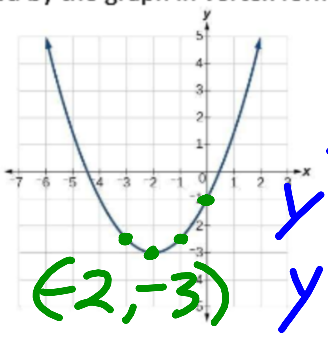
Bell Ringer

Tuesday 10/29

Write the quadratic function represented by the graph in vertex form.





$(-2,-3)$

Write the equation in standard form

$y=-3(x-1)^2+2$

$y=-3(x-1)(x-1)+2$

$y=(-3x+3)(x-1)+2$

$y=-3x^2+6x-3+2$

$-3x \quad +3$

$y=-3x^2+6x-1$

	$-3x$	$+3$
x	$-3x^2$	$+3x$
-1	$3x$	-3

$y=-2(x-2)^2+7$

$y=\frac{1}{2}(x+2)^2-3$

Turn in Week #10 Packet!

Finding Key Features of Quadratics ws due tomorrow

Essential Question

How can you compare the growth rates of linear, exponential, and quadratic functions?

Three cars start traveling at the same time. The distance traveled in t minutes is y miles. Complete each table by putting each function in your calculator and looking at the table. Then sketch all three graphs using the points from the table in the same coordinate plane. Compare the speeds of the three cars. Which car has a constant speed? Which car is accelerating the most? Explain your reasoning.

min miles

t	$y = t$
0	0
0.2	0.2
0.4	0.4
0.6	0.6
0.8	0.8
1.0	1.0

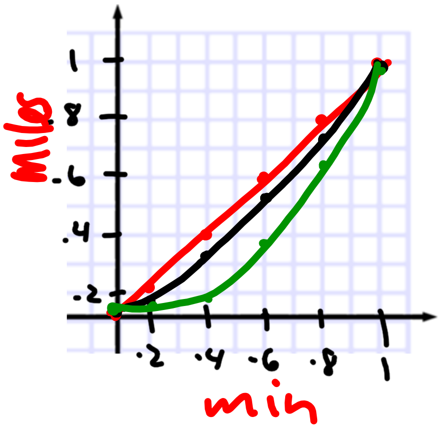
min miles

t	$y = 2^t - 1$
0	0
0.2	0.15
0.4	.32
0.6	.52
0.8	.74
1.0	1

$2 \wedge 0 - 1$

min miles

t	$y = t^2$
0	0
0.2	.04
0.4	.16
0.6	.36
0.8	.64
1.0	1



#1

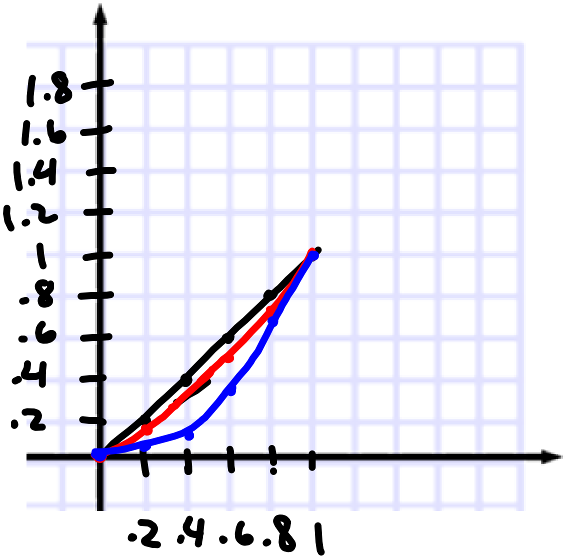
t	$y = t$
0	0
0.2	.2
0.4	.4
0.6	.6
0.8	.8
1.0	1

#2

t	$y = 2^t - 1$
0	0
0.2	.15
0.4	.32
0.6	.52
0.8	.74
1.0	1

#3

t	$y = t^2$
0	0
0.2	.04
0.4	.16
0.6	.36
0.8	.64
1.0	1



Let's look at what we found

Which car has a constant speed?

Which car is accelerating the most?

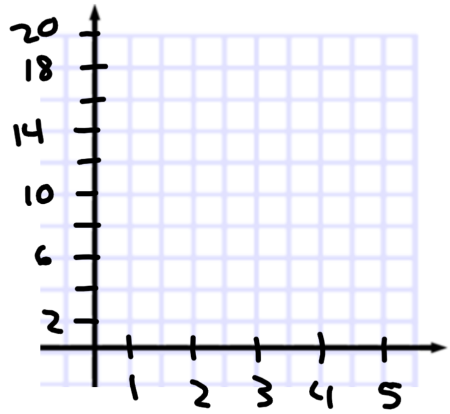
Explain your reasoning.

Analyze the speeds of the three cars over the given time periods. The distance traveled in t minutes is y miles. Which car eventually overtakes the others?

t	$y = t$
1.0	
1.5	
2.0	
2.5	
3.0	
3.5	
4.0	
4.5	
5.0	

t	$y = 2^t - 1$
1.0	
1.5	
2.0	
2.5	
3.0	
3.5	
4.0	
4.5	
5.0	

t	$y = t^2$
1.0	
1.5	
2.0	
2.5	
3.0	
3.5	
4.0	
4.5	
5.0	



Let's look at the results. Which car eventually overtakes the others?

#1

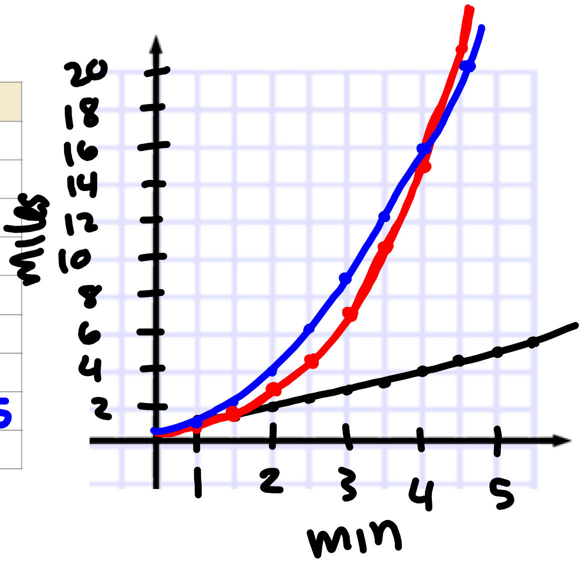
t	$y = t$
1.0	1
1.5	1.5
2.0	2
2.5	2.5
3.0	3
3.5	3.5
4.0	4
4.5	4.5
5.0	5

#2

t	$y = 2^t - 1$
1.0	1
1.5	1.8
2.0	3
2.5	4.7
3.0	7
3.5	10.3
4.0	15
4.5	21.6
5.0	31

#3

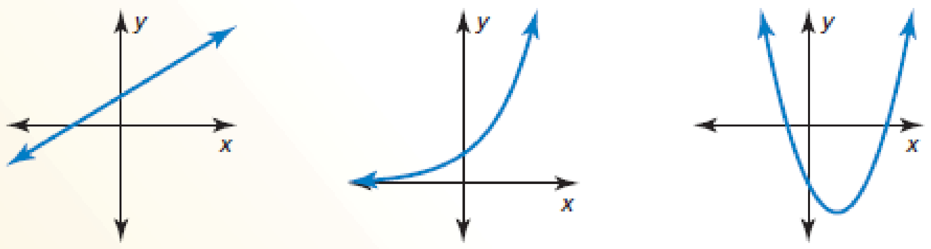
t	$y = t^2$
1.0	1
1.5	2.25
2.0	4
2.5	6.25
3.0	9
3.5	12.25
4.0	16
4.5	20.25
5.0	25



Core Concept

Linear, Exponential, and Quadratic Functions

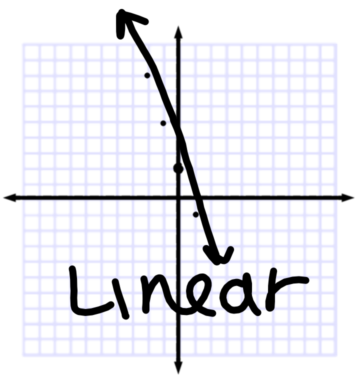
Linear Function	Exponential Function	Quadratic Function
$y = mx + b$	$y = ab^x$	$y = ax^2 + bx + c$



Plot each table of points on one of the graphs provided. Can you tell whether the points appear to represent a *linear*, an *exponential*, or a *quadratic* function. Compare with the group behind you.

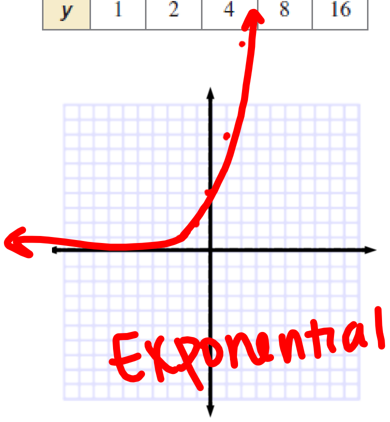
a.

x	−3	−2	−1	0	1
y	11	8	5	2	−1



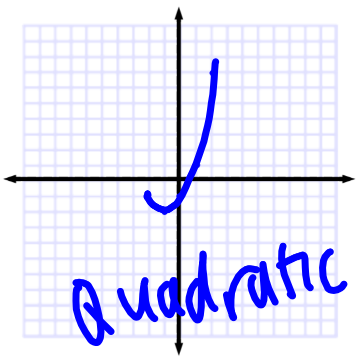
b.

x	−2	−1	0	1	2
y	1	2	4	8	16



c.

x	−2	−1	0	1	2
y	−1	−2	−1	2	7



Core Concept

Differences and Ratios of Functions

You can use patterns between consecutive data pairs to determine which type of function models the data. The differences of consecutive y-values are called *first differences*. The differences of consecutive first differences are called *second differences*.

- **Linear Function** The first differences are constant.
- **Exponential Function** Consecutive y-values have a common *ratio*.
- **Quadratic Function** The second differences are constant.

In all cases, the differences of consecutive x-values need to be constant.

We can also use patterns to tell whether each table of values represents a *linear*, an *exponential*, or a *quadratic* function. With your teammate Look at first differences, common ratios, or second differences to decide.

+1 +1 +1 +1

a.

x	-3	-2	-1	0	1
y	11	8	5	2	-1

Linear

-3 -3 -3 -3

constant rate of change

b.

x	-2	-1	0	1	2
y	1	2	4	8	16

x2 x2 x2 x2

Exponential - common ratio in y-values

c.

x	-2	-1	0	1	2
y	-1	-2	-1	2	7

Quadratic

-1 +1 +3 +5 1st dif.

2nd dif are constant

+2 +2 +2 2nd dif.

Tell whether each table of values represents a *linear*, an *exponential*, or a *quadratic* function.

a. linear

x	−3	−2	−1	0	1
y	11	8	5	2	−1

−3 −3 −3 −3

b. exp.

x	−2	−1	0	1	2
y	1	2	4	8	16

×2 ×2 ×2 ×2

$\frac{2}{1}=2$ $\frac{4}{2}=2$ $\frac{8}{4}=2$

c. quad.

x	−2	−1	0	1	2
y	−1	−2	−1	2	7

−1 +1 +3 +5

+2 +2 +2

Tell whether the table of values represents a *linear*, an *exponential*, or a *quadratic* function. Then write the function.

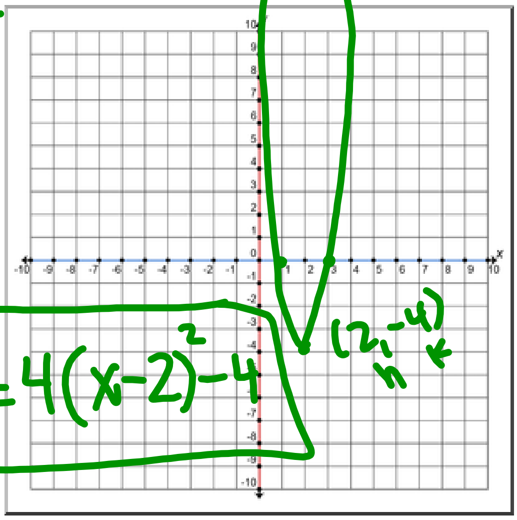
$y = a(b)^x$: a = y-int, b = ratio

x	0	1	2	3	4
***f*(*x*)**	12	0	−4	0	12

−12 −4 +4 +12

+8 +8 +8

Quad! 2nd dif → constant



$\boxed{y=4(x-2)^2-4}$

(2, −4)
h k

Tell whether the table of values represents a *linear*, *exponential* or *quadratic* function. Then write the function.

$y = a(b)^x$: a = y-int, b = ratio

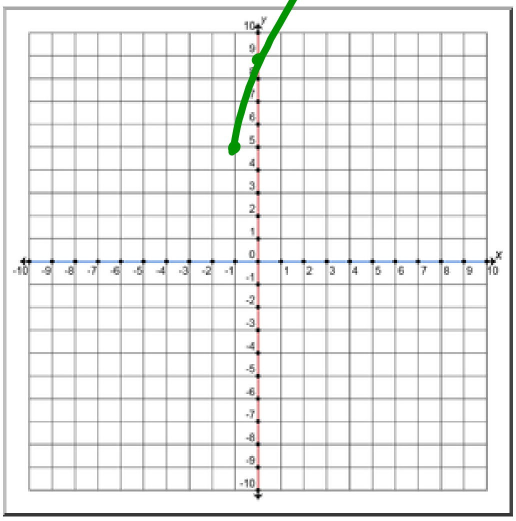
x	-1	0	1	2
f(x)	5	9	13	17

+4 +4 +4

Linear! $m = \frac{4}{1} = 4$

$y = mx + b$

$\boxed{y = 4x + 9}$



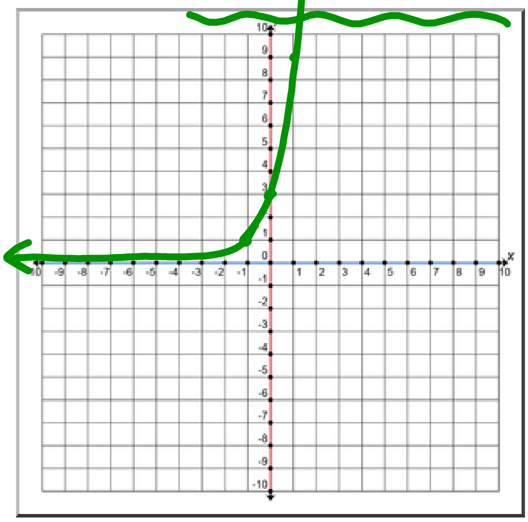
Tell whether the table of values represents a *linear*, an *exponential*, or a *quadratic* function.

x	−1	0	1	2	3
y	1	3	9	27	81

×3 ×3 ×3 ×3

$y = 3 \cdot 3^x$

$y = a(b)^x$: a = y-int, b = ratio



3.7 hw pg 175-178 #s 1, 2, 4-11, 15, 17, 20, 25, 26, 29, 38, 43

due thurs!