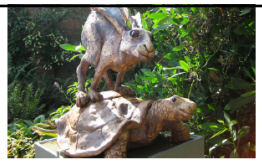
1.6 The Tortoise and The Hare

A Solidify Understanding Task



starter: complete table

In the children's story of the tortoise and the hare, the hare mocks the tortoise for being slow. The tortoise replies, "Slow and steady wins the race." The hare says, "We'll just see about that," and challenges the tortoise to a race. The distance from the starting line of the hare is given by the function:

$d = t^2$ (d in meters and t in seconds)

Because the hare is so confident that he can beat the tortoise, he gives the tortoise a 1 meter head start. The distance from the starting line of the tortoise including the head start is given by the function:

$d = 2^t$ (d in meters and t in seconds)

Time t	Tortoise 2^t	Hare t^2
0	1	0
1	2	1
2	4	4
3	8	9
4	16	16
5	32	25
6	64	36
...		
100	1.27E29	10,000

exponential, exponential, quad, linear

1. At what time does the hare catch up to the tortoise?

at 2 seconds.

2. If the racecourse is very long, who wins: the tortoise or the hare? Why?

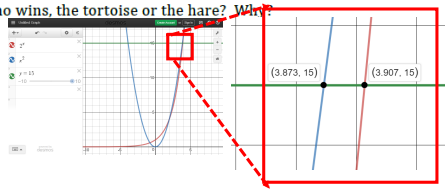
tortoise, greater rate of increase

3. At what time(s) are they tied?

at 2 seconds. & 4 sec.

4. If the racecourse were 15 meters long who wins, the tortoise or the hare? Why?

(3.9, 15) (3.87, 15) HARE! faster



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5. Use the properties $d = 2^t$ and $d = t^2$ to explain the **speeds** of the tortoise and the hare in the following time intervals:

meters/sec

Interval	Tortoise $d = 2^t$	Hare $d = t^2$
[0, 2)	$\frac{4-1}{2-0} = \frac{3}{2} = 1.5$ mps	$\frac{4-0}{2-0} = \frac{4}{2} = 2$ mps
[2, 4)	$\frac{16-4}{4-2} = \frac{12}{2} = 6$ mps → Same	
[4 ,∞)	The speed increases exponentially faster!	The speed is increasing quadratically

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SECONDARY MATH II // MODULE 1
QUADRATIC FUNCTIONS – 1.5

1.6 ~~1.5~~

READY, SET, GO! Name Period Date

READY

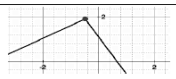
Topic: Recognizing Functions

Vertical/pencil

Identify which of the following representations are functions. If the representation is NOT a function state how you would fix it so it was.

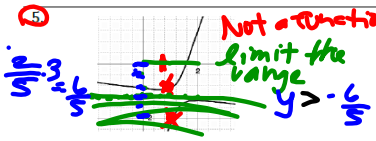
1. D = {(4,-1) (3, -6) (2, -1) (1, 2) (0, 4) (2, 5)}

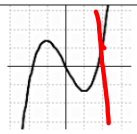
2. The number of calories you have burned since midnight at any time during the day.

3. 

4.

x	-12	-8	-6	-4
$f(x)$	25	25	25	25

5. 

6. 

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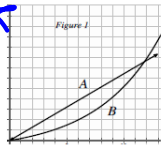
SET

Topic: Comparing rates of change in linear, quadratic, and exponential functions

The graph at the right shows a time vs. distance graph of two cars traveling in the same direction along the freeway.



7. Which car has the cruise control on? How do you know?

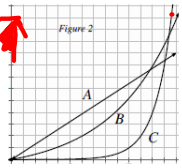
8. Which car is accelerating? How do you know?

9. Identify the interval in *figure 1* where car A seems to be going faster than car B.

10. For what interval in *figure 1* does car B seem to be going faster than car A?

11. What in the graph indicates the speed of the cars?

12. A third car *C* is now shown in the graph (*see figure 2*). All 3 cars have the same destination. If the destination is a distance of 12 units from the origin, which car do you predict will arrive first? Justify your answer.



C

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GO

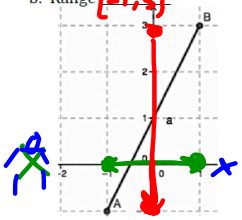
Topic: Identifying domain and range from a graph

drive - domain
range - rise

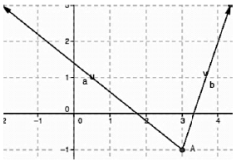
[close (open

State the domain and range of each graph. Use interval notation where appropriate.

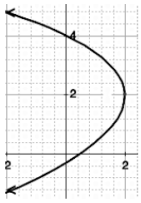
13a. Domain [-1, 0]
b. Range [-1, 3]



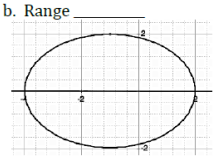
14a. Domain _____
b. Range _____



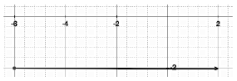
15a. Domain _____
b. Range _____



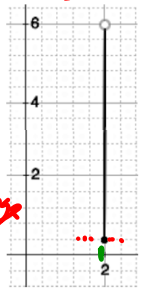
16a. Domain _____
b. Range _____



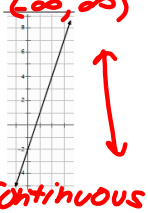
17a. Domain _____
b. Range _____



18a. Domain [2
b. Range (2/3, 6)

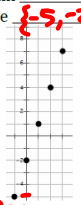


19a. Domain _____
b. Range (-∞, ∞)



Continuous

20a. Domain _____
b. Range {-5, -2, 1, 4, 7}



range

discrete

21. Are the domains of #19 and #20 the same? Explain.

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SECONDARY MATH II // MODULE 1
QUADRATIC FUNCTIONS - 1.6

1.7 ~~1.6~~

READY, SET, GO! Name Period Date

READY

Topic: Transforming lines

1. Graph the following linear equations on the grid. The equation y = x has been graphed for you. For each new equation explain what the number 3 does to the graph of y = x. Pay attention to the y-intercept, the x-intercept, and the slope. Identify what changes in the graph and what stays the same.

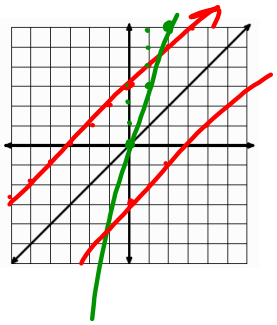
a. y = x + 3

shift up 3

0	3
1	4
2	5

b. y = x - 3

c. y = 3x + 0



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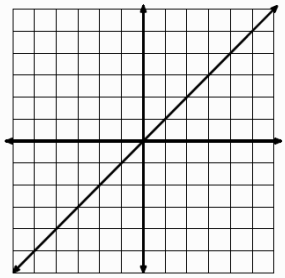
2. The graph of y = x is given. (*See figure 2.*) For each equation predict what you think the number -2 will do to the graph. Then graph the equation.

a. y = x + (-2)
Prediction:

b. y = x – (-2)
Prediction:

c. y = -2x
Prediction:



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SET

Topic: Distinguish between linear, exponential and quadratic functions

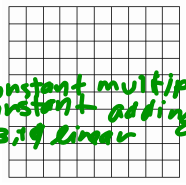
For each relation given:

a. Identify whether or not the relation is a function. (If it's not a function, skip b – d.)
b. Determine if the function is Linear, Exponential, Quadratic or Neither.
c. Describe the type of growth.
d. Express the relation in the indicated form.

3. I had 81 freckles on my nose before I began using vanishing cream. After the first week I had 27, the next week 9, then 3 . . .

a. Function?
b. Linear, Exponential, Quadratic or Neither
c. How does it grow? 1st difference pattern. +2, +3, +4 linear
d. Make a graph. Label your axes and the scale Show all 4 points.

•2 constant multiplying
+2 constant adding



4.

x	y
0	81
1	$80\frac{2}{3}$
2	$80\frac{1}{3}$
3	80
4	$79\frac{2}{3}$

a. Function?
b. Linear, Exponential, Quadratic or Neither
c. How does it grow?
d. Write the explicit equation.

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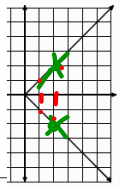
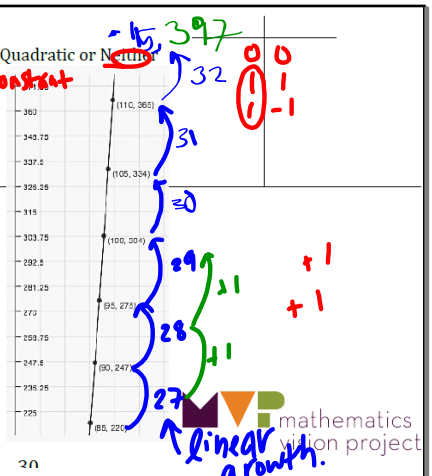
5.



a. Function? NO
b. Linear, Exponential, Quadratic or Neither
c. How does it grow? constant
d. Create a table



6. Speed in mph of a baseball vs. distance in ft.

a. Function? yes
b. Linear, Exponential, Quadratic or Neither
c. How does it grow? linear
d. Predict the distance the baseball flies, if it leaves the bat at a speed of 115 mph.

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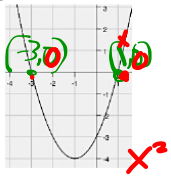
GO

Topic: Matching function representations

Match the function on the left with the equivalent function on the right.

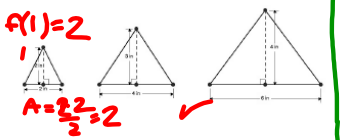
___7. $f(x) = -2x + 5$

f 8.



g ___9. I put $7000 in a savings account that pays 3% interest compounded annually. I plan to leave it in the bank for 20 years. The amount I will have then.

___10. The area of the triangles below.



___11. $f(0) = 5; f(n) = 2 * f(n-1)$

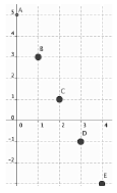
___12. $f(0) = 5; f(n) = f(n-1) - 2$

___13.

x	-7.75	-¼	½	11.6
f(x)	7.75	¼	-½	-11.6

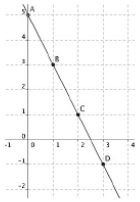
a. $f(x) = 5(2)^x$

b.



c. $f(1) = 2;\ f(n+1) = f(n) + 2$

d.



e. $y + x = 0$

f. $y = (x-1)(x+3)$

g. $A = 7000(1.03)^{\ }$

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