Warmup 9/ (The age you are when you can first vote)

Created by Mr. Lischwe

1) **Try to figure out the rule from the table. Write it in function notation.**

x	d(x)
2	27
3	33
4	39
5	45
6	51

$$d(x) = 6x + 15$$

2) **EARLY FINISHERS: Compare homework answers!**

Check homework

FUNCTIONS QUIZ FRIDAY!

TOPICS COVERED:

- Creating/matching graphs of stories
- Is it a function? Table/graph/real-world situation
- Evaluating functions (finding f(3), etc.)
- Writing a function rule from a table (guess my rule)
- Writing a function rule from a real-world situation and labeling inputs/outputs
- Graphing functions using a table
- Understanding which equations will be linear and nonlinear
- Identifying key features of graphs
  - Increasing/decreasing
  - X- and Y-intercepts
  - Slope
- **THIS LIST WILL BE POSTED ON MY WEBSITE!**

IMPORTANT PATTERN:

- **f(x) = ___x + ___ is always a straight line!!!**

PATTERNS…

f(x) = 4x

x	f(x)
1	4
2	8
3	12
4	16
5	20

g(x) = 4x + 5

x	g(x)
1	9
2	13
3	17
4	21
5	25

h(x) = 4x – 2

x	h(x)
1	2
2	6
3	10
4	14
5	18

j(x) = -5x + 20

x	j(x)
1	15
2	10
3	5
4	0
5	-5

k(x) = 7x – 3

x	k(x)
1	4
2	11
3	18
4	25
5	32

l(x) = 100x + 5

x	l(x)
1	105
2	205
3	305
4	405
5	505

Multiplication table…

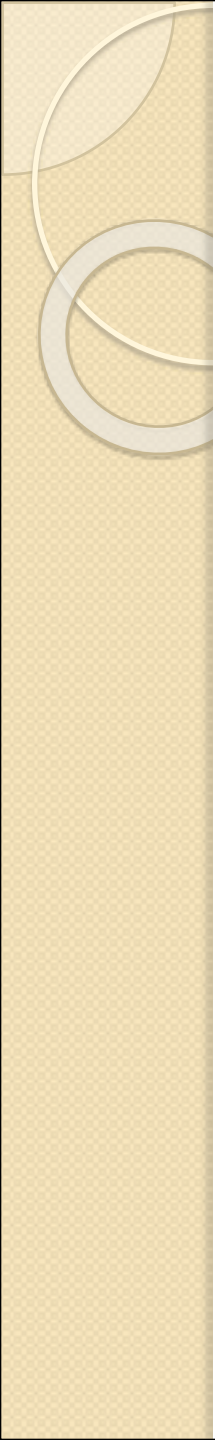**NOTICE: The numbers in the "4s" row are all 4 apart.**

So the outputs of "y = 4x" would all be 4 apart.

If I added one to each number in the 4's row, would they still all be 4 apart?

Therefore, the outputs of y = 4x + 1 would still all be 4 apart.

EXTREMELY IMPORTANT PATTERN:

- If your inputs are consecutive numbers, and your outputs increase by a constant number, that is the "multiplying" number in the equation.
  - Outputs increase by 4 → Rule has a "4x"
  - Outputs decrease by 2 → Rule has a "-2x"

- (we will write one more thing here in a little bit – leave some space)

So, how does this help me with "guess my rule???"

- Guess <u>consecutive numbers</u>!!!

COPY:

What's the rule???

x	a(x)
1	4
2	7
3	10
4	13
5	16

- **The outputs increase by 3, so a(x) = 3x + something**

- **Test out numbers & see that you also need to add 1.**

- **a(x) = 3x + 1**

Whiteboard: Can you get these rules???

1)

x	a(x)
1	4
2	7
3	10
4	13
5	16

a(x) = 3x + 1

2)

x	b(x)
5	15
6	20
7	25
8	30
9	35

b(x) = 5x – 10

3)

x	c(x)
-2	-7
-1	-5
0	-3
1	-1
2	1

c(x) = 2x – 3

4)

x	d(x)
0	10
1	6
2	2
3	-2
4	-6

d(x) = -4x + 10

One more…

x	f(x)
1	3
2	6
3	11
4	18
5	27

- **The "trick" does not work here, because the outputs do not increase by a constant amount.**

- **Tables like this have different types of equations that are NOT "times something plus or minus something"**

- **This table was most likely created by an equation with an exponent somewhere.**

Look at #1 on your Graphing Functions Sheet…

- Would our "trick" work for this one?

- The outputs are increasing by 2. And the equation has a "2x!"

- Based on the table, does it make sense why this graph would be a straight line?

NOTICE:

- #3 had a "$\frac{1}{2}x$" in the rule. And the outputs increase by ½.

- #5 had a "-3x" in the rule. And the outputs decrease by -3.

EXTREMELY IMPORTANT PATTERN:

- If your inputs are consecutive numbers, and your outputs increase by a constant number, that is the "multiplying" number in the equation.
  - Outputs increase by 4 → Rule has a "4x"
  - Outputs decrease by 2 → Rule has a "-2x"

- ***If the outputs increase or decrease by a constant number, your graph will be a straight line!!!***

Summarizing everything…

- Any equation with something like a "5x" will have outputs that increase by 5.

- This will also cause the graph to be a straight line (linear).

- Things like exponents, square roots, and absolute value make the outputs NOT have a constant increase.

- These graphs will NOT be a straight line.

KEY FEATURES OF GRAPHS

a(x) = 2x + 4
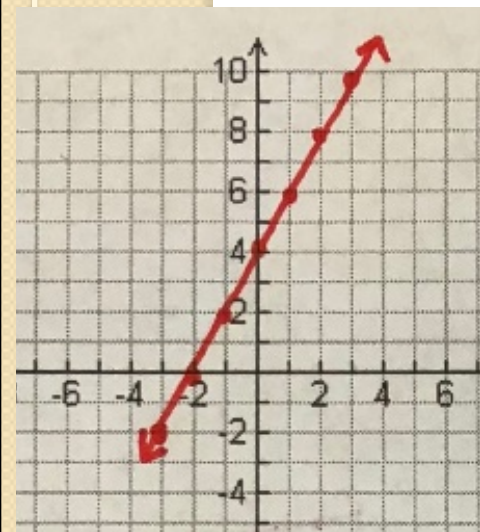
$c(x) = \frac{1}{2}x + 8$
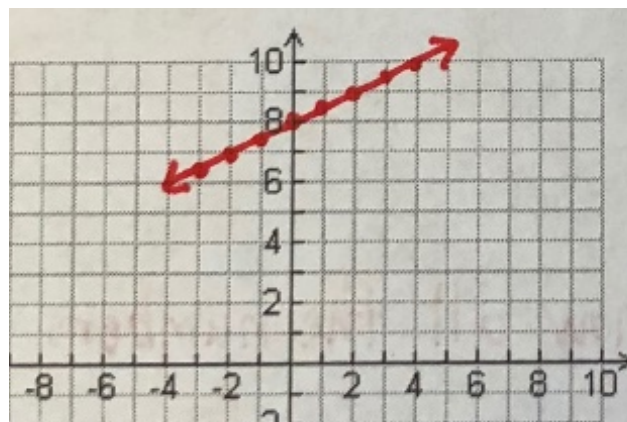
$e(x) = 2 - 3x$
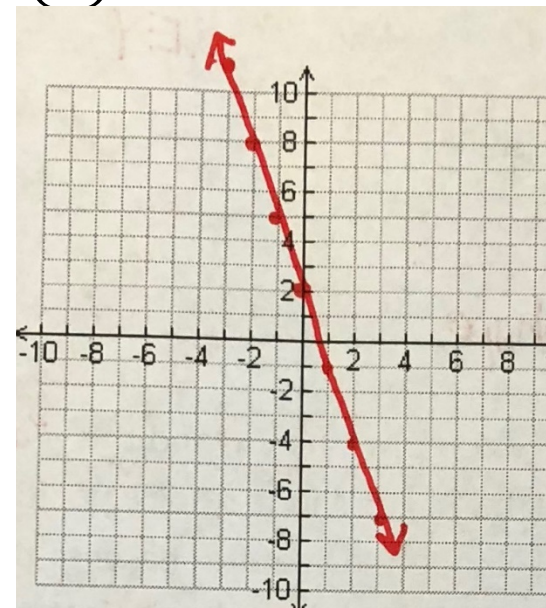
b(x) = x² − 3
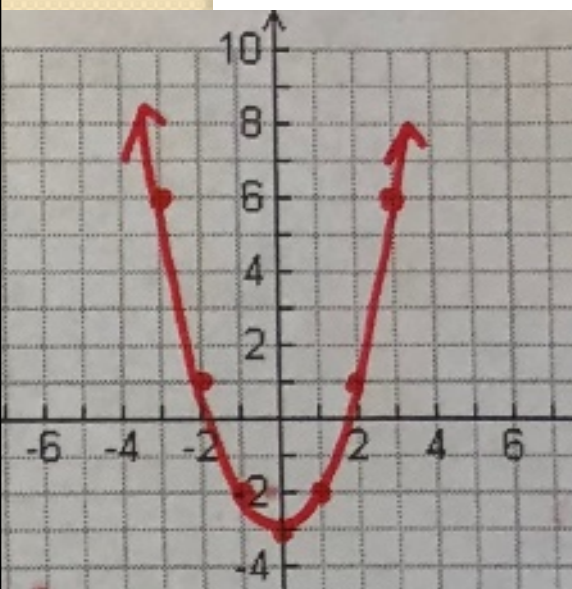
$d(x) = |x - 2|$
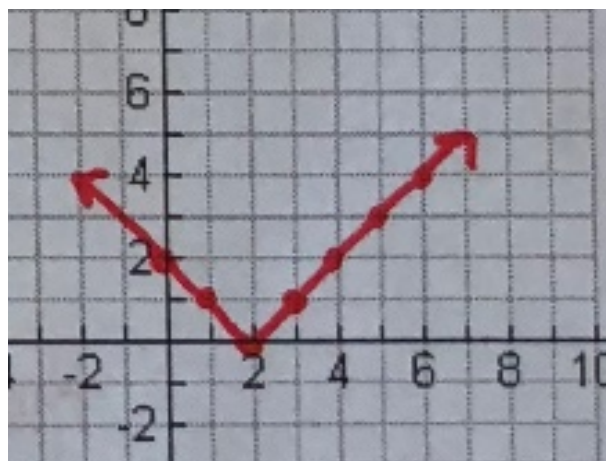
$f(x) = \sqrt{x + 10}$
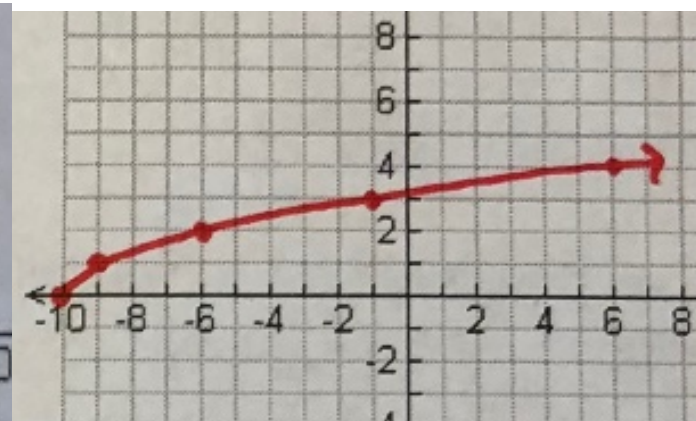
Key Features of Graphs

Increasing: Where the y-values go up (from left to right)

Decreasing: Where the y-values go down (from left to right)

X-intercept: Where the graph crosses the x-axis

Y-intercept: Where the graph crosses the y-axis

Slope: How steep the graph is

ALWAYS READ A GRAPH FROM LEFT TO RIGHT!!!

a(x) = 2x + 4

$c(x) = \frac{1}{2}x + 8$

$e(x) = 2 - 3x$
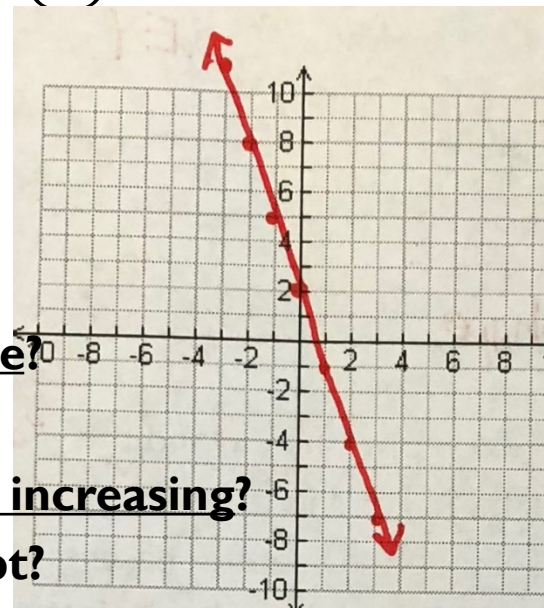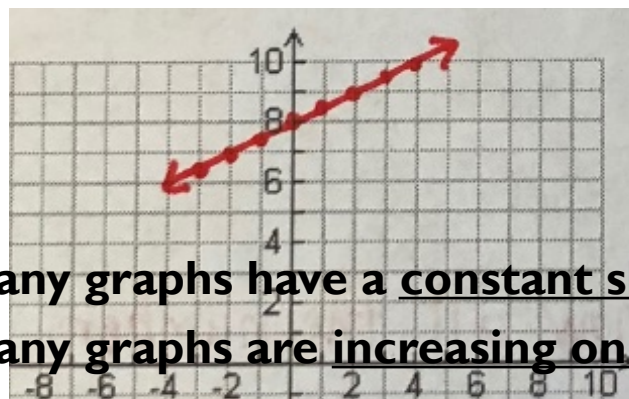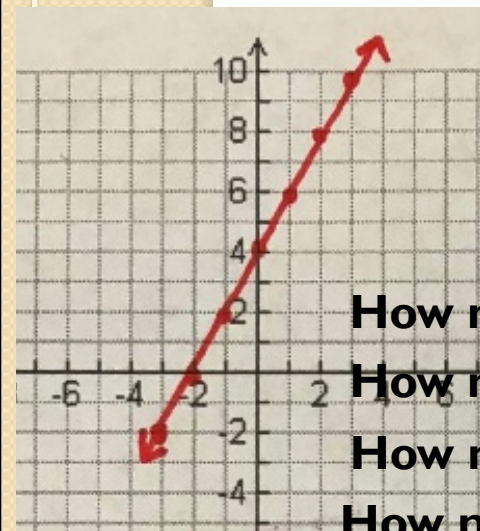
How many graphs have a <u>constant slope</u>?
How many graphs are <u>increasing only</u>?
How many graphs are <u>decreasing, then increasing</u>?
How many graphs have ONE x-intercept?

b(x) = x² − 3

$d(x) = |x - 2|$

$f(x) = \sqrt{x} + 10$
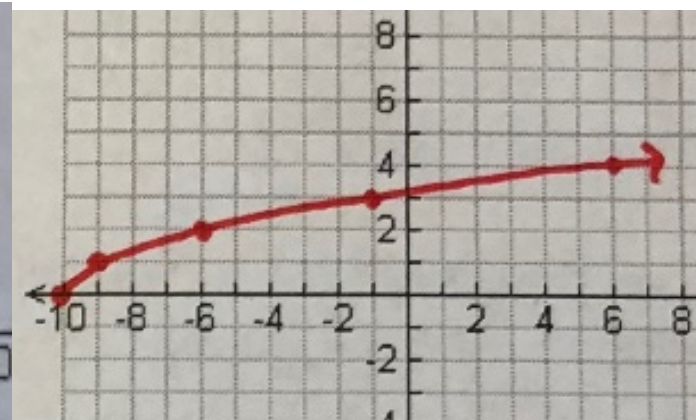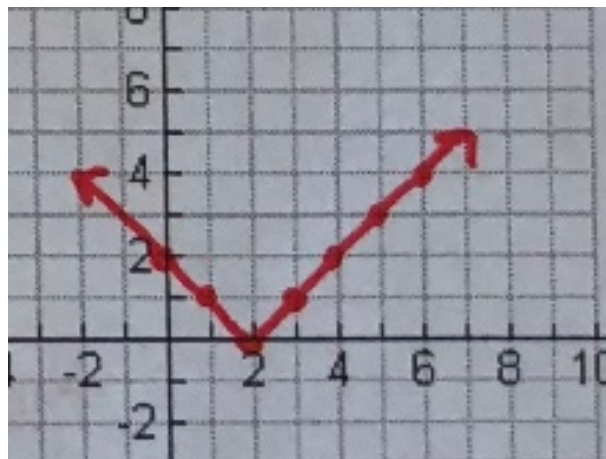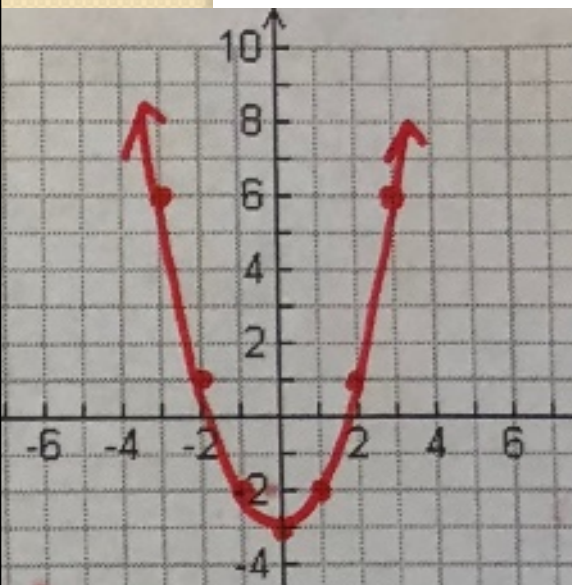
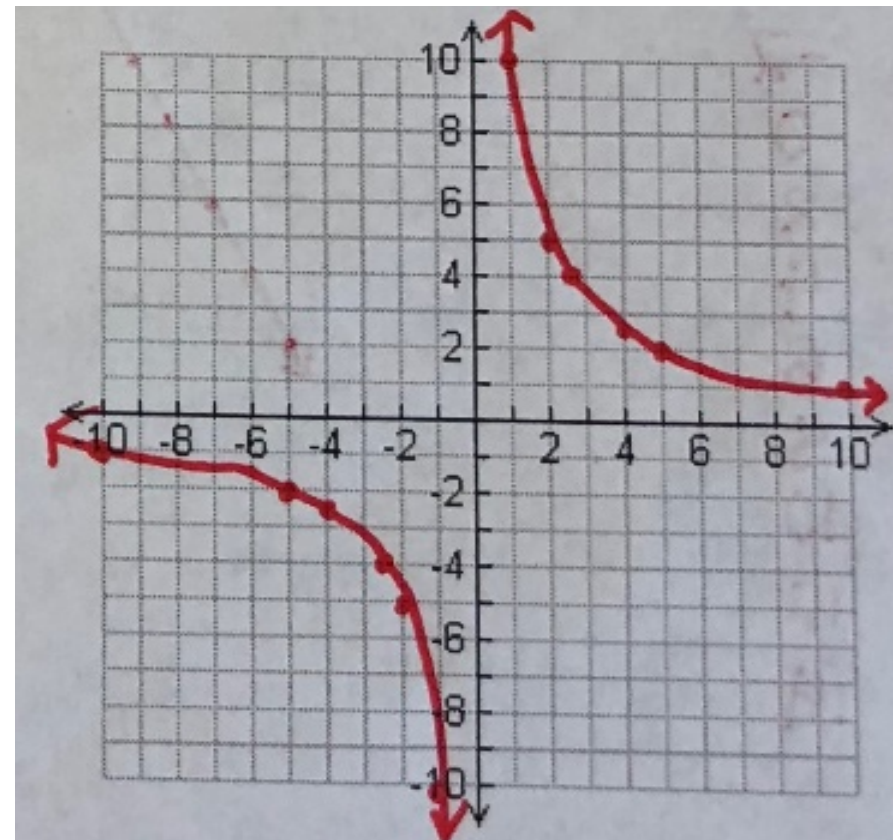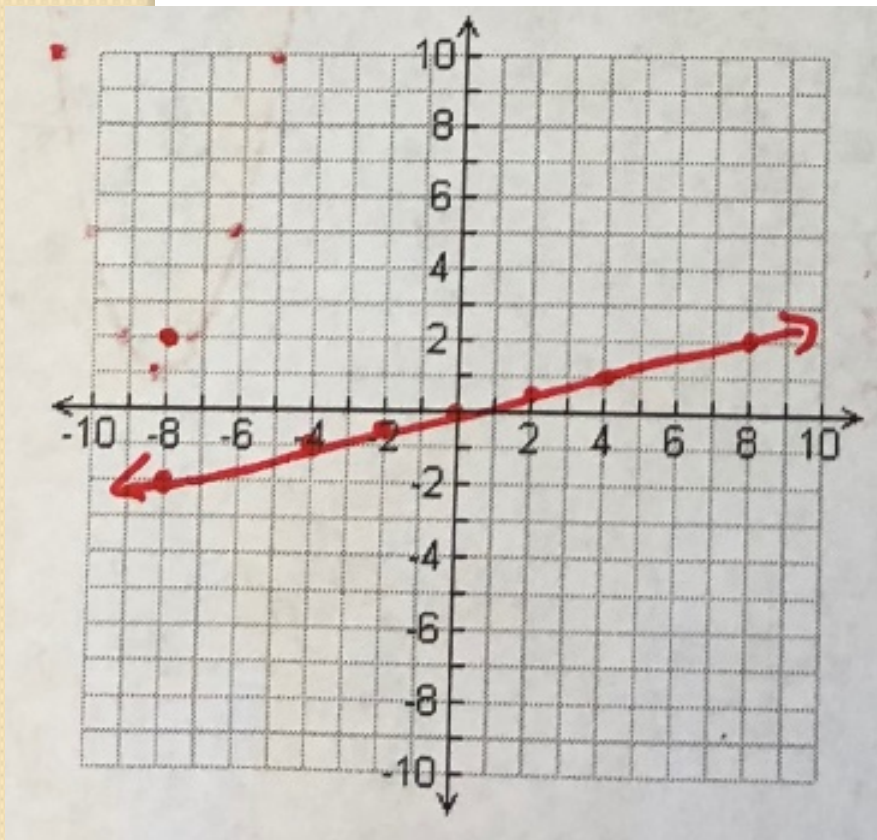**Increasing/decreasing?**

Constant slope?

x-intercept?

y-intercept?

Increasing/decreasing?

Constant slope?

x-intercept?
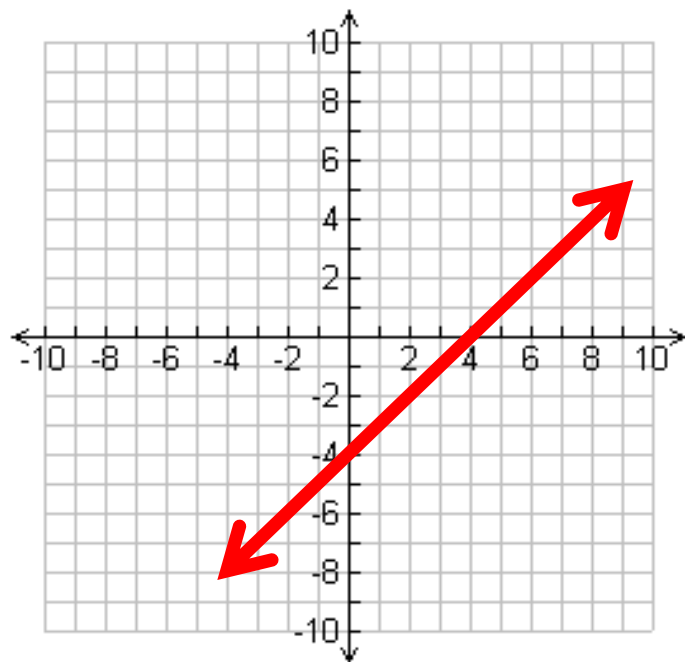
y-intercept?

Increasing/Decreasing? **Both increasing**

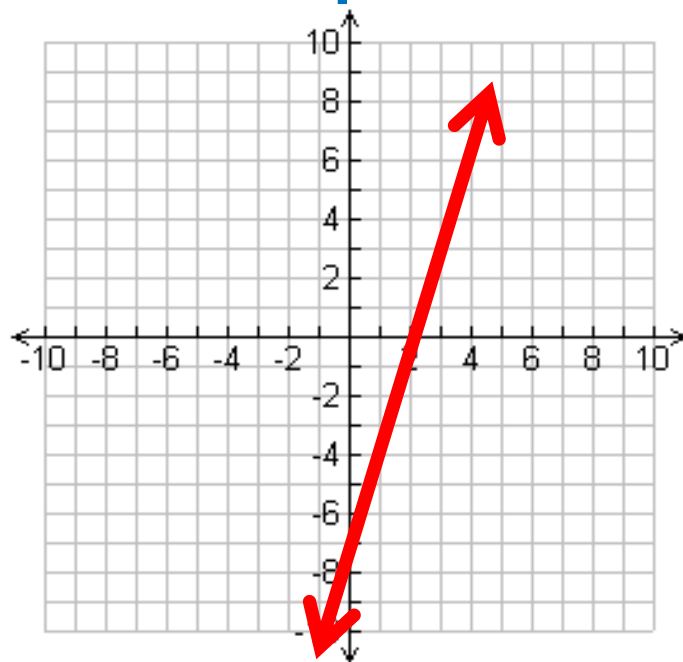Which graph has a greater **x-intercept?** **Graph 1**

Which graph has a greater **y-intercept?** **Graph 1**
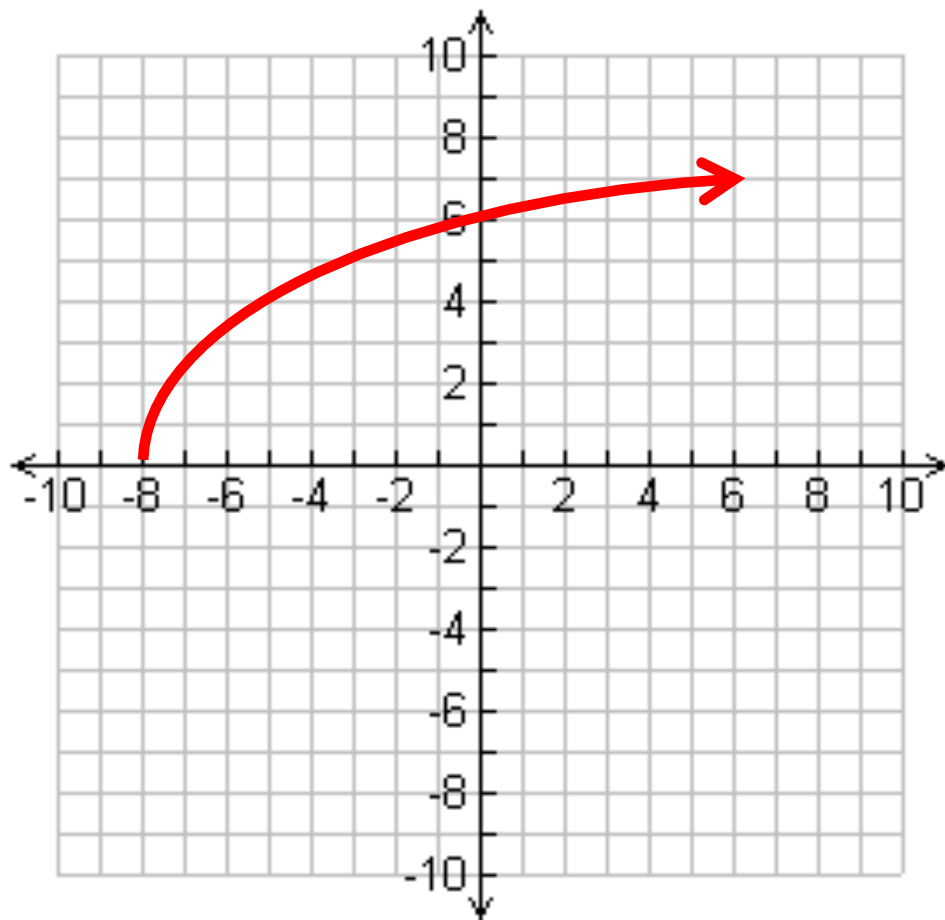
Which graph has a greater **slope?** **Graph 2**

Graph 1

Graph 2

Key features?

Increasing/decreasing?
Always increasing

X-intercept?
-8

Y-intercept?
6

Describe the **slope.**

The slope is not constant.

Above and beyond answer: the slope starts out very steep, then gets gradually less steep

Key features?

Increasing/decreasing?

Increasing, then decreasing, then increasing, then decreasing, etc.
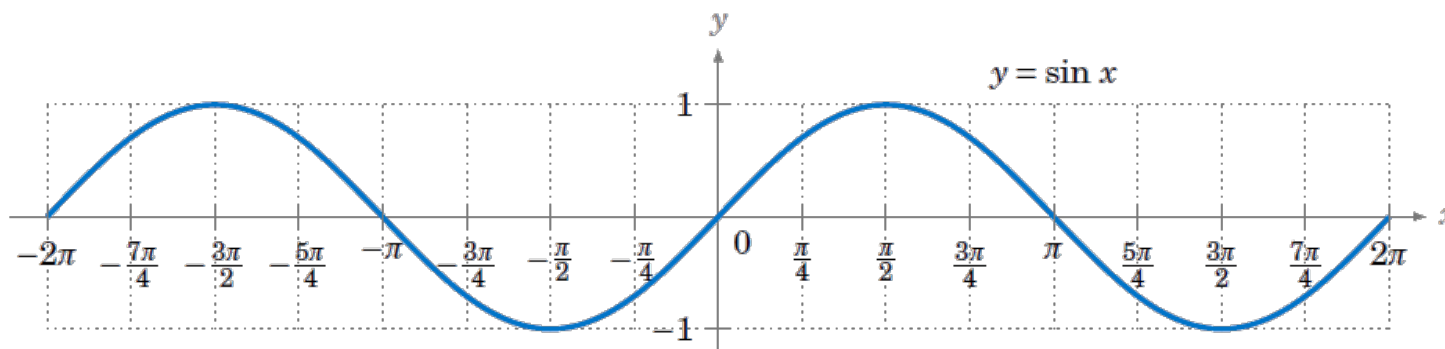
X-intercept?

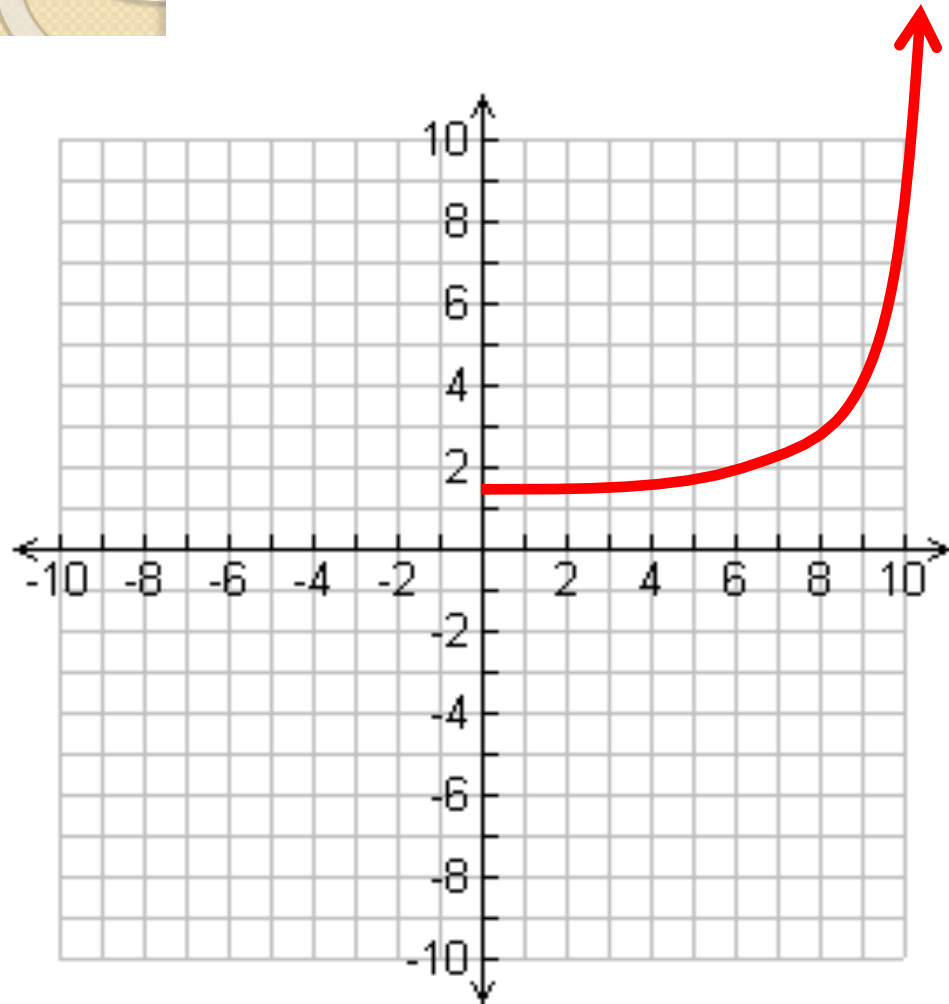$-2\pi, -\pi, 0, \pi, 2\pi$

Y-intercept?

0

Describe the **slope.**

The slope is not constant.

$y = \sin x$

Key features?

Increasing/decreasing?
Always increasing

X-intercept?
None

Y-intercept?
About 1.5
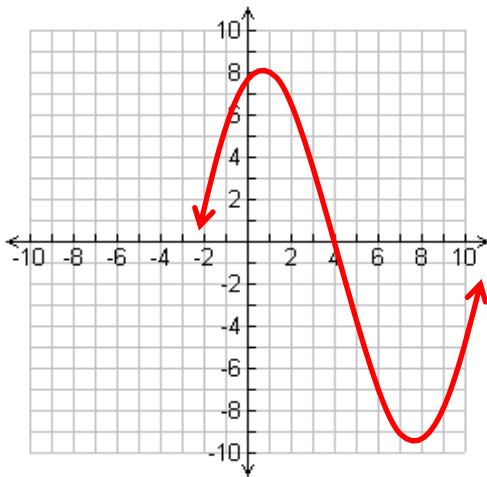
Describe the **slope.**
The slope is not constant. It starts not very steep, then gets steeper and steeper.
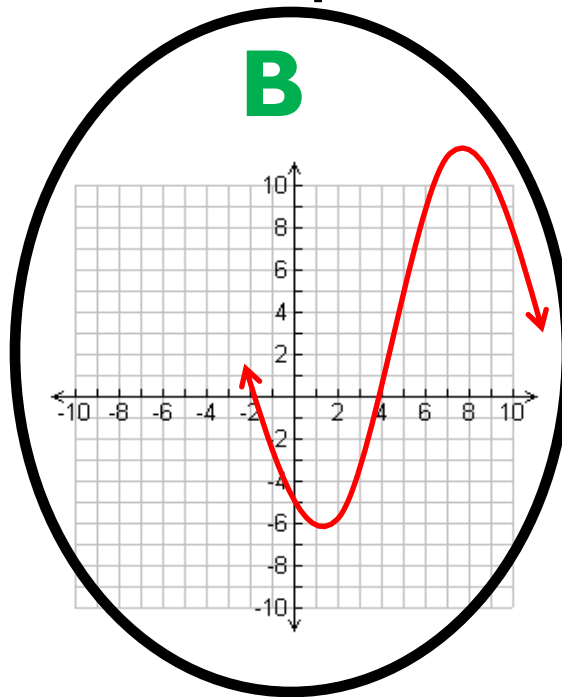
Choose the graph that is:

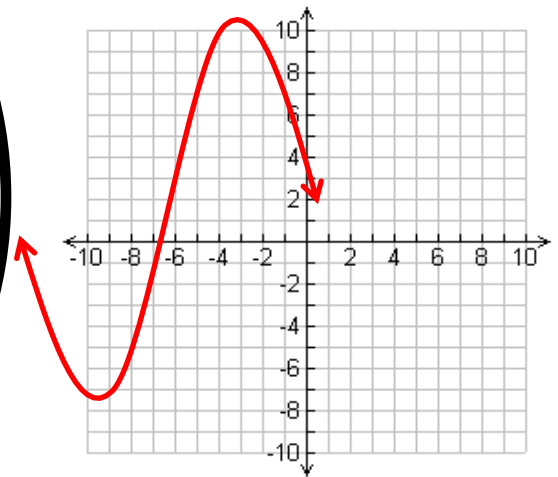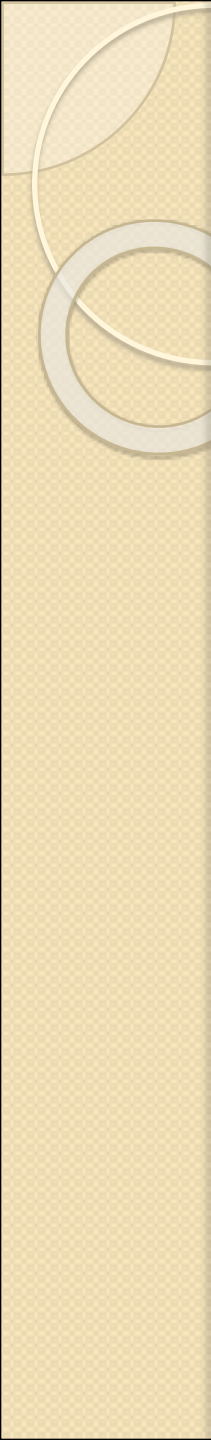- Decreasing, then increasing, then decreasing

- Has an x-intercept of 4

A   **B**   **C**
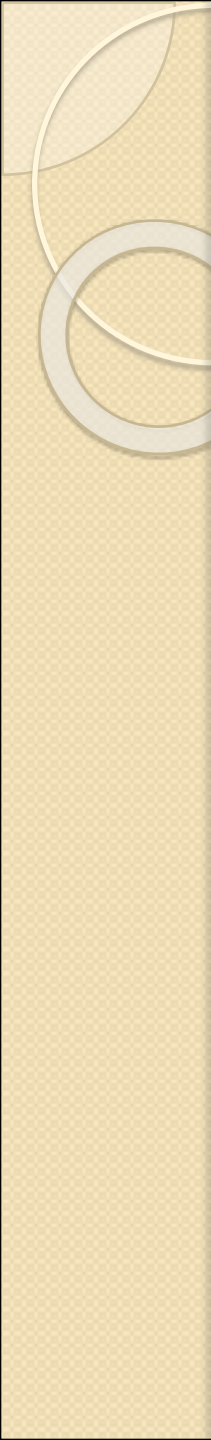
Draw a graph with the following characteristics:

- **x and y-intercepts are <u>both</u> zero**

- **Always decreasing**

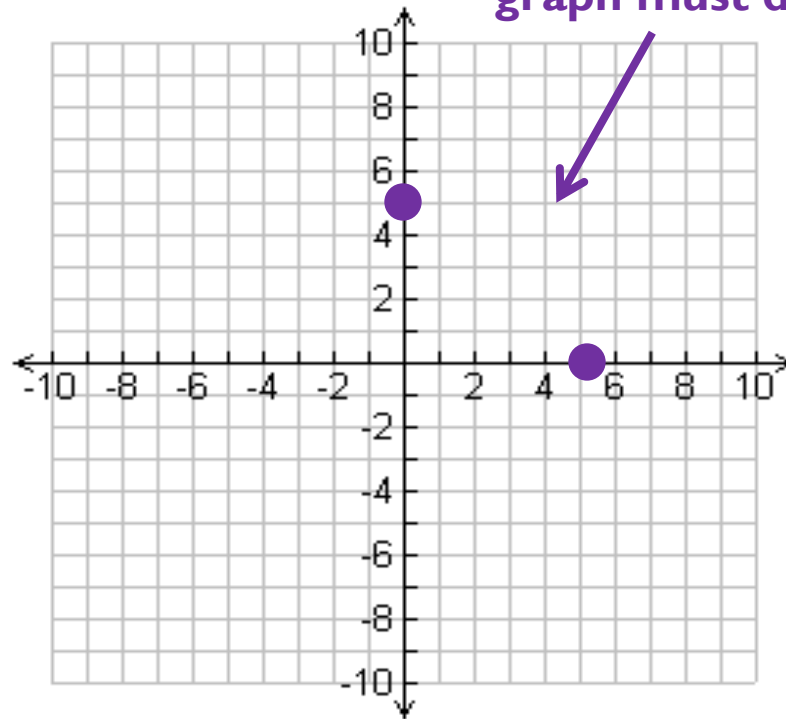- **Slope doesn't change**

Draw a graph with the following characteristics:

- **Always increasing**

- **The slope changes**

IS this possible?

- Draw a graph that is increasing, where the x-and y-intercept are both 5.

To connect these two points, the graph must decrease!

IMPOSSIBLE

Draw each. If a graph is not possible, say so.

A) A graph that is increasing only, which has an x-intercept of -4 and a y-intercept of 6.
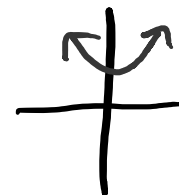
B) A graph that is increasing, then decreasing, has x-intercepts of 5 and -5, and a y-intercept of -9. IMPOSSIBLE

C) A graph that is increasing, then decreasing, then increasing again, that has x-intercepts of -8, 2, and 7, and a y-intercept of 4.

D) A graph that is decreasing, then increasing, that does not have an x-intercept.

All are possible except (B)

HOMEWORK

- Create your own functions WS