



MISSISSIPPI

EXEMPLAR

Units & Lessons

MATHEMATICS

Foundations of Algebra

Grant funded by:



Lesson 2: Change in Graphs

Focus Standard(s): FOA.15, FOA.16

Standards for Mathematical Practice: SMP.2, SMP.4, SMP.6, SMP.7, SMP.8

Estimated Time: 55 minutes

Resources and Materials:

- Anchor Chart Paper
- Scissors
- Tape
- Handout 2.1: Words to Graphs
- Handout 2.2: Graphing Linear Functions by Ordered Pairs
- Handout 2.3: Gallery Walk Task Cards
- Handout 2.4: Gallery Walk Reflection Sheet

Lesson Target(s):

- Students will understand that the slope of the line describes the change the line undergoes.
- Students will evaluate a linear function for a given input value.
- Students will graph a linear function by ordered pairs.

Guiding Question(s):

- How can you graph a line by using ordered pairs that make the function true?
- How do changes in linear functions define the direction and rate of change in the lines they produce?

Vocabulary

Academic Vocabulary:

- Ordered pairs
- Rate of change
- Slope
- y-intercept

Instructional Strategies for Academic Vocabulary:

- Model how to use the words in discussion
- Discuss the meaning of word in a mathematical context
- Create pictures/symbols to represent words
- Write/discuss using the words

Symbol



Type of Text and Interpretation of Symbol

Instructional support and/or extension suggestions for students who are EL, have disabilities, or perform well below the grade level and/or for students who perform well above grade level

✓

Assessment (Pre-assessment, Formative, Self, or Summative)

Instructional Plan

Understanding Lesson Purpose and Student Outcomes: Students will create graphs to represent real-world situations. Students will graph two ordered pairs and use the line to demonstrate the change between the two points.

Anticipatory Set/Introduction to the Lesson: Words to Graphs

Display the situation on **Handout 2.1: Words to Graphs** and allow the students time to create a graph to represent the scenario.

For students who are EL, have disabilities, or perform well below grade level:

- Provide a model of the coordinate plane and the labels on the x and y-axis.

Extensions for students with high interest or working above grade level:

- Ask students to identify the days when Jaylin has the greatest rate of change and how we know.
- Have students explain slope in the context of the problem.

Invite a student to sketch or display a graph to go with the situation. Section off the graph based on the rate of change. Facilitate a whole group discussion. Instruct students to Turn and Talk to explain what the rate of change tells us about each section. Continue the discussion by sharing ideas about how a graph could be used to help us make predictions.

Activity 1: Show Me the Change Activity

Remind students that the focus of the unit is change. Ask students to share different types of changes they saw in the previous lesson. After discussing the types of change, ask students to consider what change looks like (SMP.4).

Have students work in pairs or in groups. Give students approximately 5 minutes to plan a way to represent change without using words. Ways of showing change could include acting out change, drawing change, or displaying change in a mathematical way without using words. At the end of 5 minutes, the students take turns to show their change. Use student examples to make connections to change that can be shown mathematically.

For students who are EL, have disabilities, or perform well below grade level:

- Discuss types of change with student and then assist them in planning ways to demonstrate it without speaking.

Extensions for students with high interest or working above grade level:

- Students who are gifted artistically should be given the opportunity to make Anchor Charts of change to display in the classroom.

Activity 2: Graphing Linear Functions Guided Notes

Distribute **Handout 2.2: Graphing Linear Functions by Ordered Pairs**. Instruct students to follow along and fill in the appropriate sections.

Note: As students complete the notes, make sure to give additional examples needed for clarification.

Activity 3: Making Connections in Representations Gallery Walk

Note: Prior to this activity, hang 6 pieces of anchor chart paper and label the pages A-F. This activity will be done as a Red-Light-Green-Light, where students must have work checked before moving on to the next task.

Distribute **Handout 2.3: Gallery Walk Task Cards**, scissors, and tape to groups of 3-4 students. Instruct students to fill in ordered pairs to satisfy the equation.

- ✓ Check ordered pairs for each team before allowing them to move on to graphing.

Have students graph the ordered pairs they selected on the coordinate plane provided. Encourage students to use a ruler and draw a straight line going through the points (SMP.6).

- ✓ Check graphs for each team before allowing them to cut and tape on to the anchor chart paper.

Once all graphs are correct, have teams cut along the dotted lines and tape each card to the corresponding poster. Provide each student with **Handout 2.4: Gallery Walk Reflection Sheet**.

Assign each team a different poster to begin their Reflection Sheet. Students will respond to the prompts, paying special attention to the common traits of each graph and equation (SMP.2, SMP.7). The reflection that students are asked to do can be very useful in building deep understanding of the slope and initial value of a linear function.

For students who are EL, have disabilities, or perform well below grade level:

- Have students identify common traits in two graphs and equations at a time.

Extensions for students with high interest or working above grade level:

- Have students write a conjecture about slope and y-intercept and the impact on parallel and intersecting lines.

Reflection and Closing:

- ✓ Facilitate a whole group discussion on the students' observations during the Gallery Walk. Clarify the slope and y-intercept and how they define the graphs of the lines that model them. Ask students to begin constructing more efficient ways that would be more effective for graphing to replace creating a table of values (SMP.8).

Reflect on how well the students were able to answer the following essential questions by examining evidence of student learning:

- How can change be displayed in real-world situations and in graphs of linear functions?
- How can you graph a line by using ordered pairs that make the function true?
- How do changes in linear functions define the direction and rate of change in the lines they produce?

Homework

Students will write two linear equations with similar characteristics to $y = 4x - 1$.

One equation must have the same rate of change and one must have the same y-intercept.

Handout 2.1: Words to Graph

Name: _____

Date: _____

Create a graph to accompany the following situation.

Jaylin keeps track of the hours she plays Legend of Zelda on her Nintendo Switch. This month, she played for an hour each night from Monday through Thursday and three hours on both Friday and Saturday. Jaylin did not play on Sunday. Create a graph to represent the number of hours Jaylin played Zelda over a 2-week period.

Handout 2.2: Graphing Linear Functions by Ordered Pairs

Name: _____

Date: _____

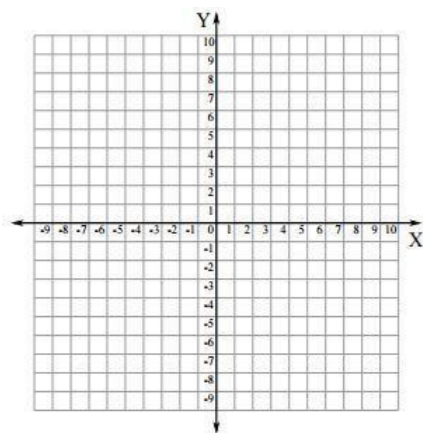
Graphing Linear Functions by Ordered Pairs

1. A coordinate plane is made of 2 _____ that run into each other perpendicularly.
2. Any point on the coordinate plane is named with a(n) _____. In an ordered pair, the first number always gives the _____ and the second number always gives the _____ value.
3. One way to graph is to make ordered pairs based on your linear function. To make an ordered pair, you can choose any number for the _____ value of the ordered pair as long as your ordered pair will show up on the graph. Then you substitute your _____ value into the equation to find your y-value. Repeat this to make at least 4 ordered pairs.

Make 4 ordered pairs for each function and then plot your points and connect them to make the line.

4. $y = 2x - 4$

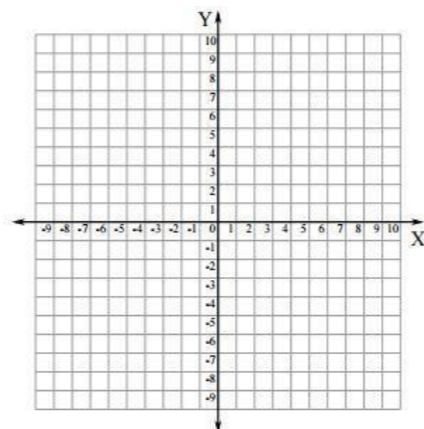
(,) (,) (,) (,)



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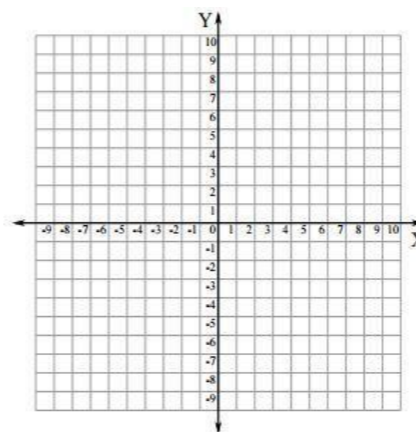
5. $y = x + 2$

(,) (,) (,) (,)



6. $y = -x + 3$

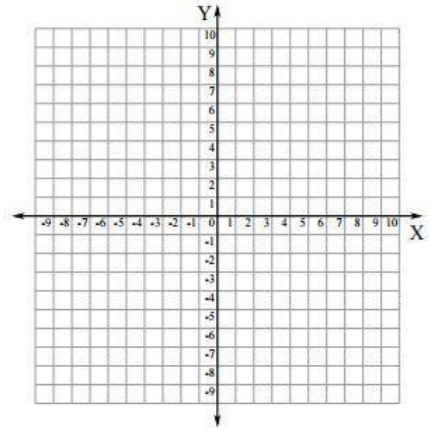
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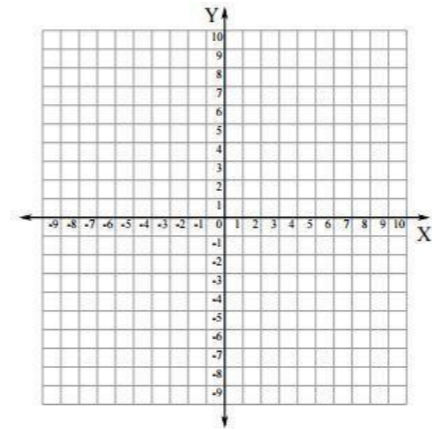
Foundations of Algebra • Edition 1

7. $y = 1/2 x$

(,) (,) (,) (,)



Extra grid for next class



Graphing Linear Functions by Ordered Pairs **KEY**

1. A coordinate plane is made of 2 NUMBER LINES that run into each other perpendicularly.
2. Any point on the coordinate plane is named with a(n) ORDERED PAIR. In an ordered pair, the first number always gives the x-value and the second number always gives the y- value.
3. One way to graph is to make ordered pairs based on your linear function. To make an ordered pair, you can choose any number for the x- value of the ordered pair as long as your ordered pair will show up on the graph. Then you substitute your x- value into the equation to find your y-value. Repeat this to make at least 4 ordered pairs. The points will create a line since they all follow the same PATTERN.

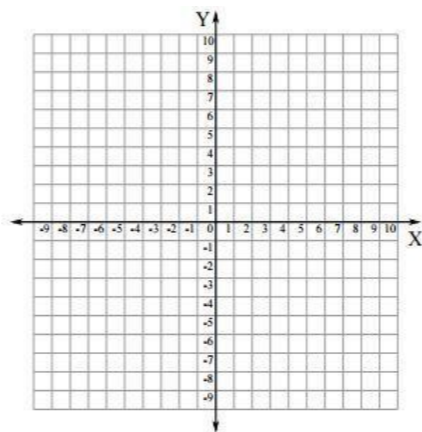
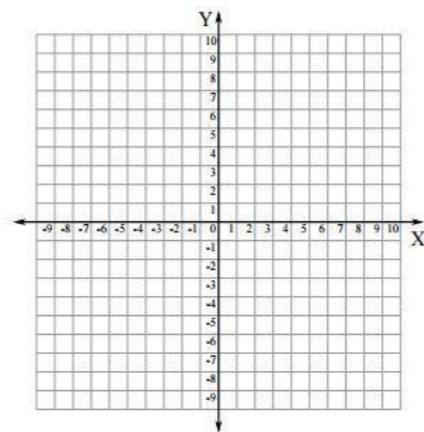
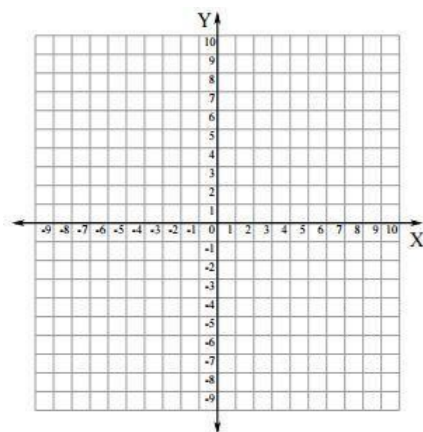
Make 4 ordered pairs for each function and then plot your points and connect them to make the line.

4. **$y = 2x - 4$**

5. **$y = x + 2$**

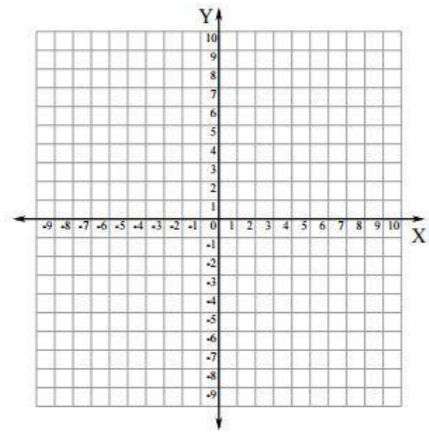
6. **$y = -x + 3$**

(,) (.) (,) (,) (,) (.) (,) (,) (,) (.) (,) (,)



7. $y = 1/2 x$

(,) (.) (,) (,)



Handout 2.3: Gallery Walk Task Cards

GROUP 1

For each one, make the ordered pairs by substituting the given x-values to find y. Once that is completed, ask your teacher to check the pairs. Then, graph your points on the coordinate plane. Make a nice long line that goes through them all.

Equation: $y = x + 5$

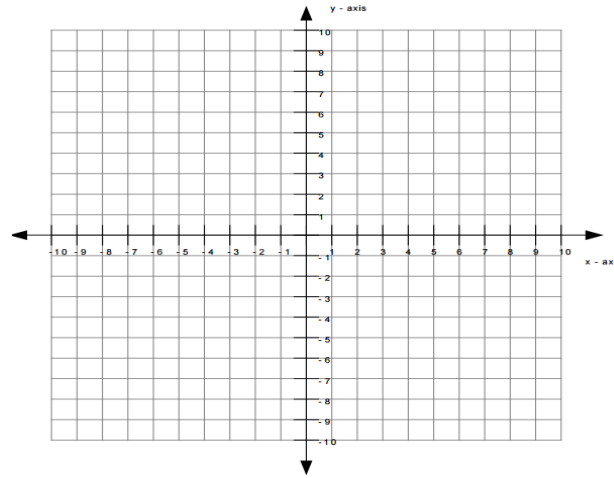
A

(-1, _____)

(2, _____)

(0, _____)

(3, _____)



Equation: $y = -2x + 6$

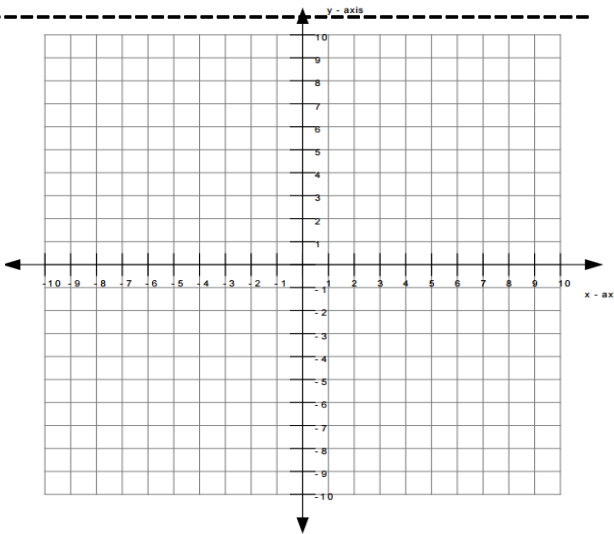
B

(1, _____)

(2, _____)

(0, _____)

(3, _____)



Equation: $y = 1x + 3$

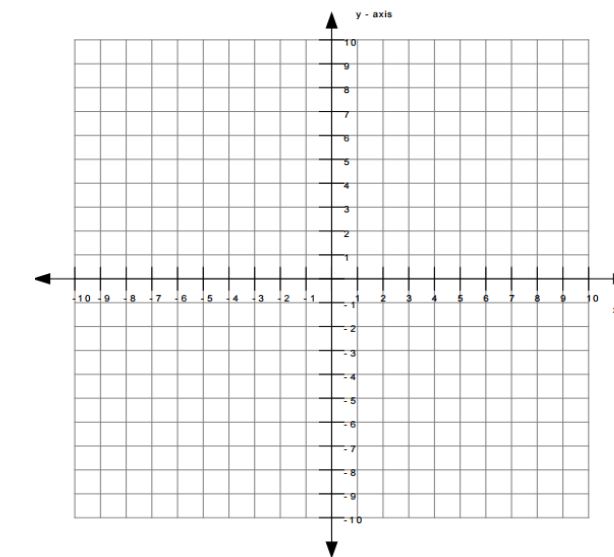
C

(-1, _____)

(2, _____)

(0, _____)

(3, _____)



Equation: $y = -2x - 3$

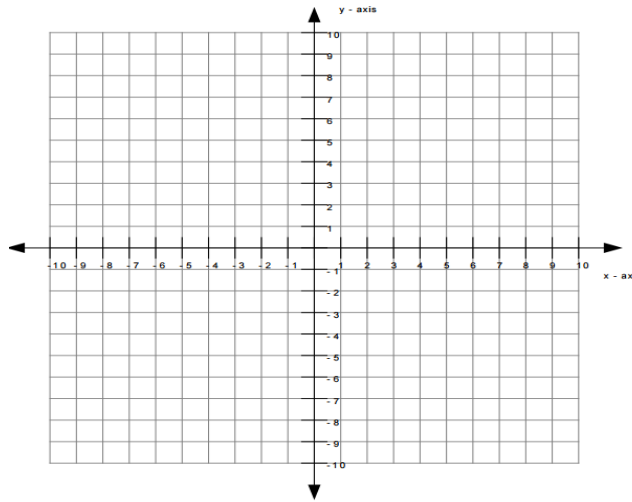
(-1, _____)

D

(-2, _____)

(0, _____)

(1, _____)



Equation: $y = -x$

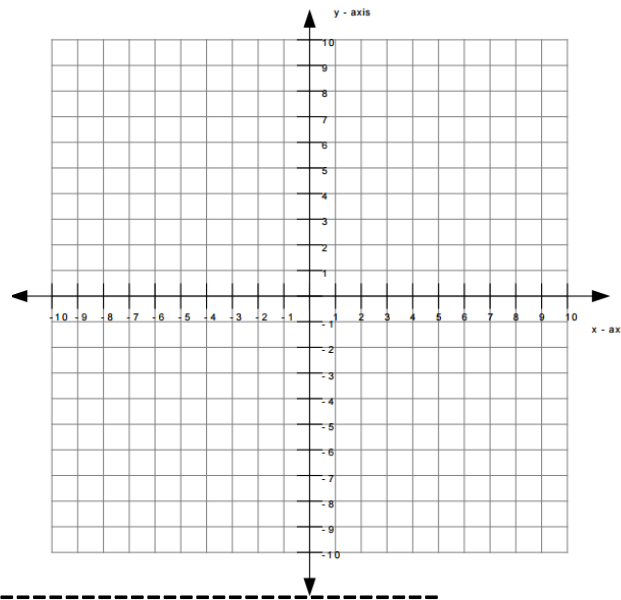
(1, _____)

E

(-2, _____)

(-3, _____)

(3, _____)



Equation: $y = 2x$

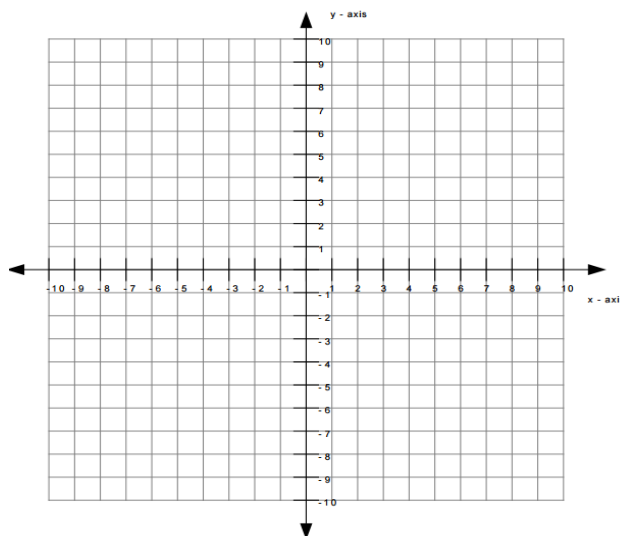
(-1, _____)

F

(2, _____)

(0, _____)

(-3, _____)



GROUP 2

For each one, make the ordered pairs by substituting the given x-values to find y. Once that is completed, ask your teacher to check the pairs. Then, graph your points on the coordinate plane. Make a nice long line that goes through them all.

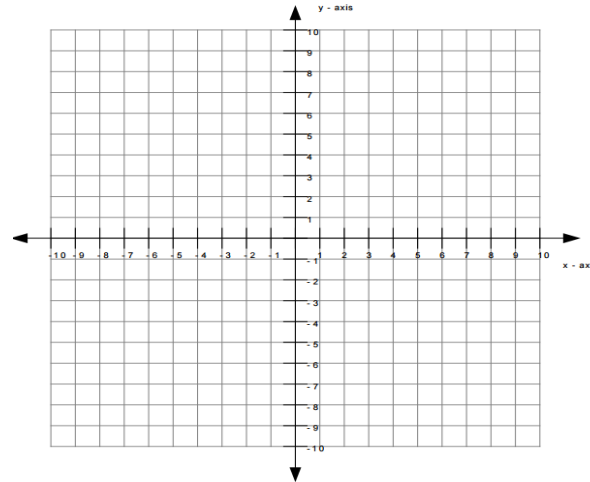
Equation: $y = -2x + 5$

(-1, _____)

A (2, _____)

(0, _____)

(3, _____)



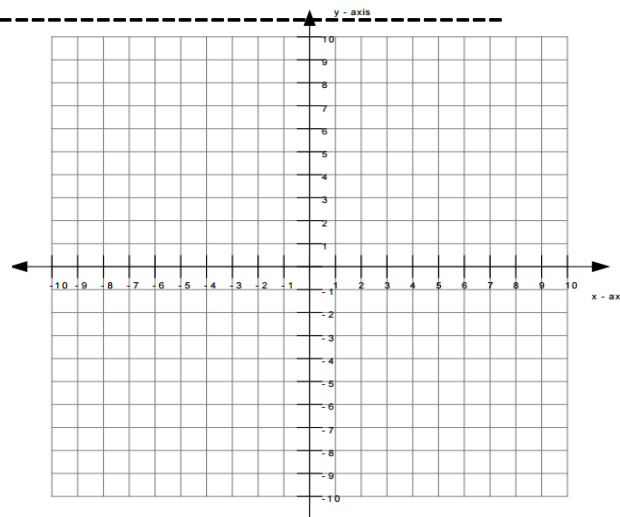
Equation: $y = -2x + 3$

(-1, _____)

B (-2, _____)

(0, _____)

(3, _____)



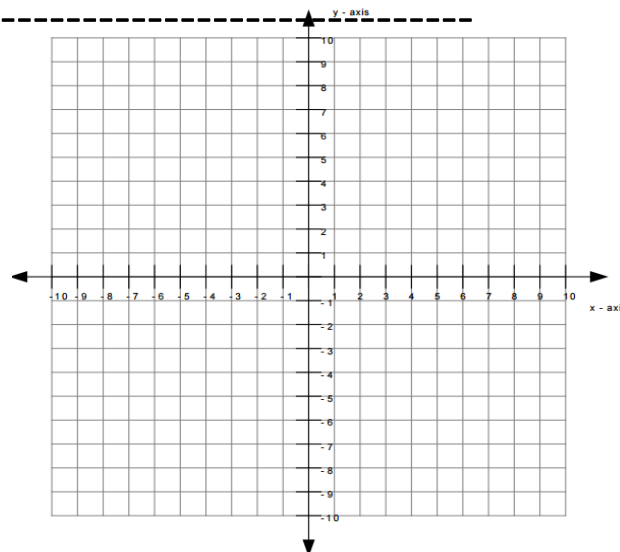
Equation: $y = 1x - 7$

(3, _____)

C (2, _____)

(0, _____)

(-1, _____)



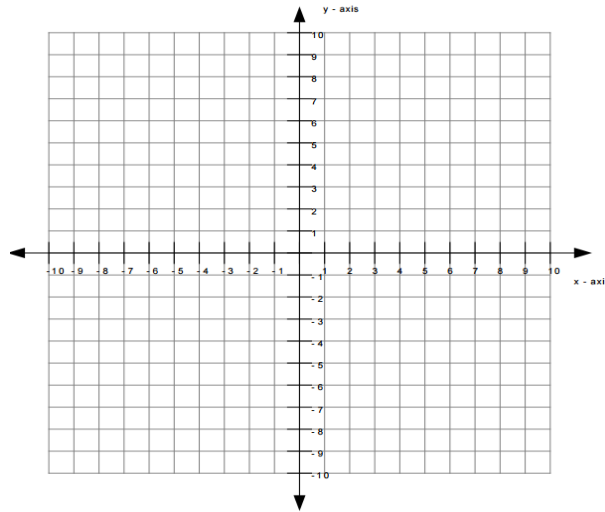
Equation: $y = x - 3$

(-1, _____)

D (-2, _____)

(3, _____)

(4, _____)



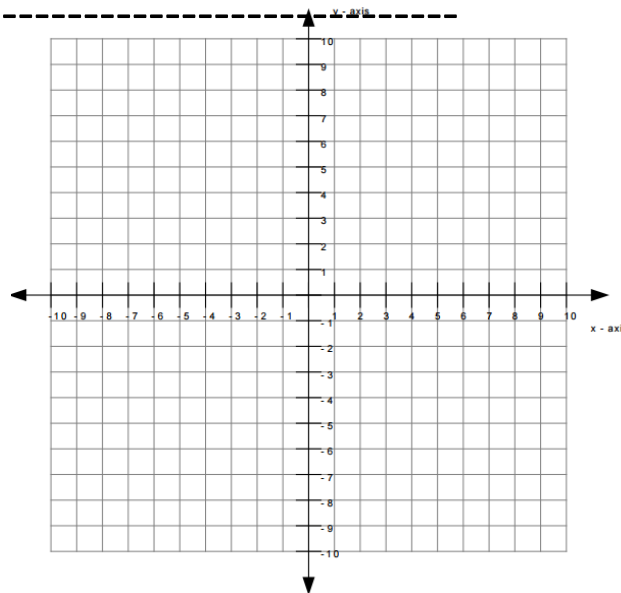
Equation: $y = -x + 1$

(1, _____)

E (-2, _____)

(-3, _____)

(0, _____)



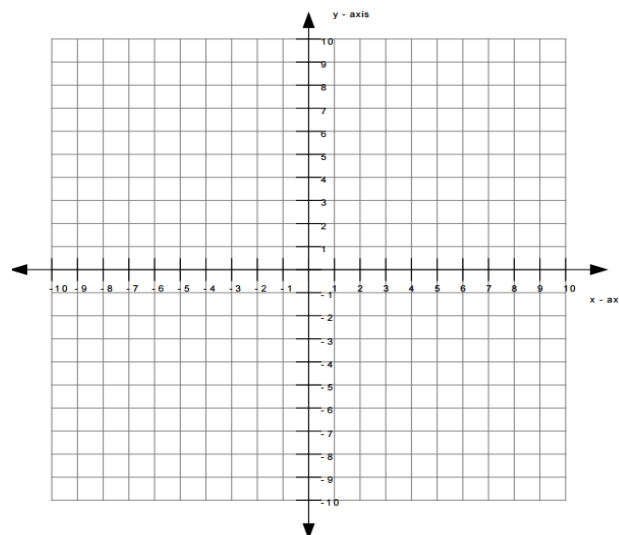
Equation: $y = 2x + 1$

(-1, _____)

F (2, _____)

(0, _____)

(-3, _____)



GROUP 3

For each one, make the ordered pairs by substituting the given x-values to find y. Once that is completed, ask your teacher to check the pairs. Then, graph your points on the coordinate plane. Make a nice long line that goes through them all.

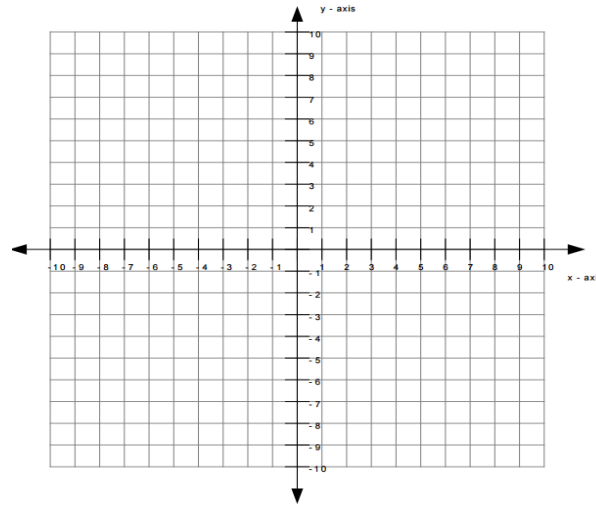
Equation: $y = -1x + 5$

(-1, _____)

A (2, _____)

(-2, _____)

(3, _____)



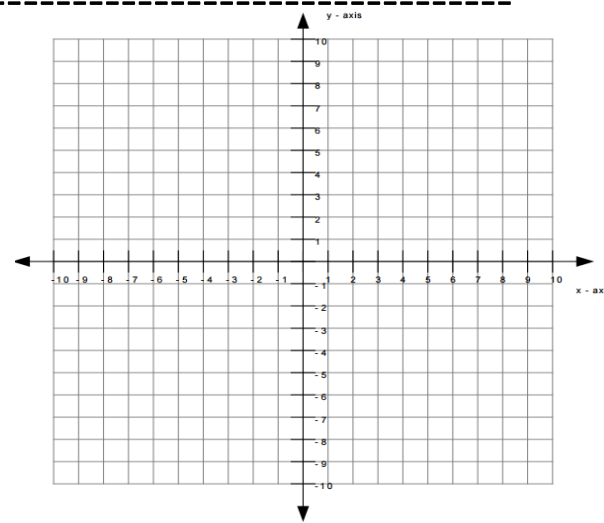
Equation: $y = -2x - 1$

(-3, _____)

B (2, _____)

(0, _____)

(1, _____)



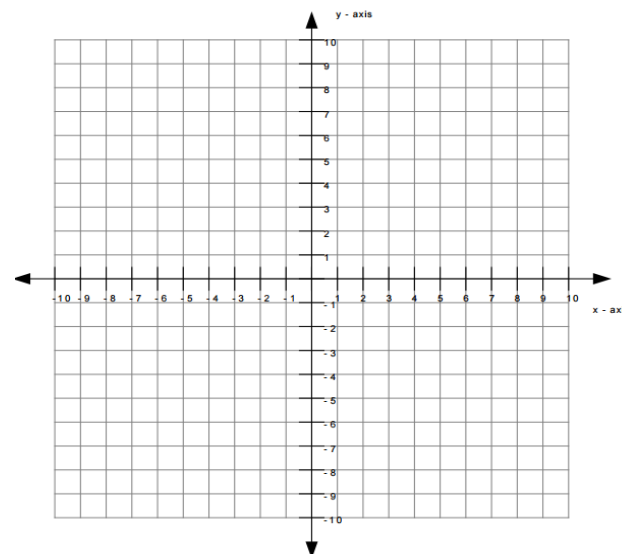
Equation: $y = x + 4$

(-1, _____)

C (2, _____)

(0, _____)

(-3, _____)



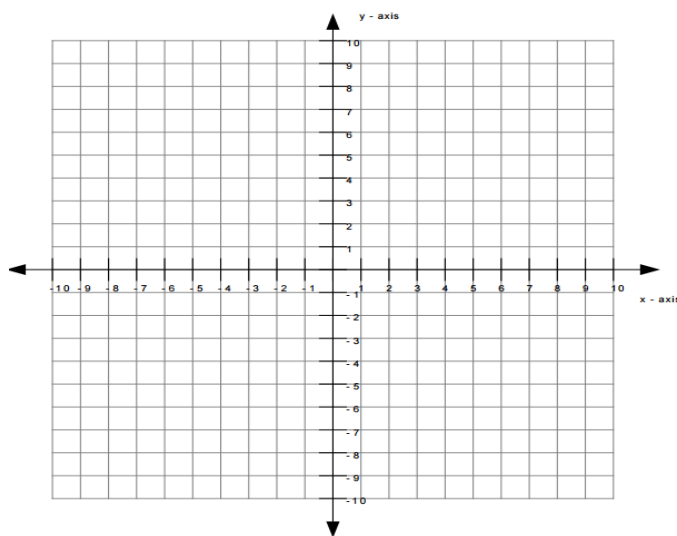
Equation: $y = 2x - 3$

(-1, _____)

D (2, _____)

(3, _____)

(4, _____)



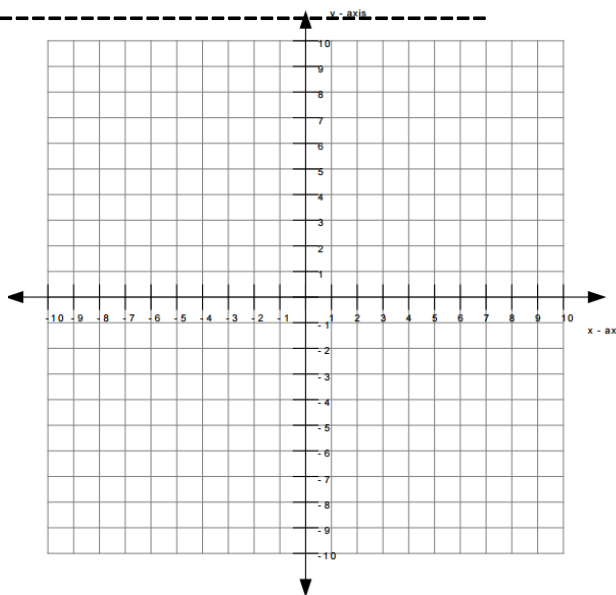
Equation: $y = -x + 5$

(1, _____)

E (-2, _____)

(0, _____)

(6, _____)



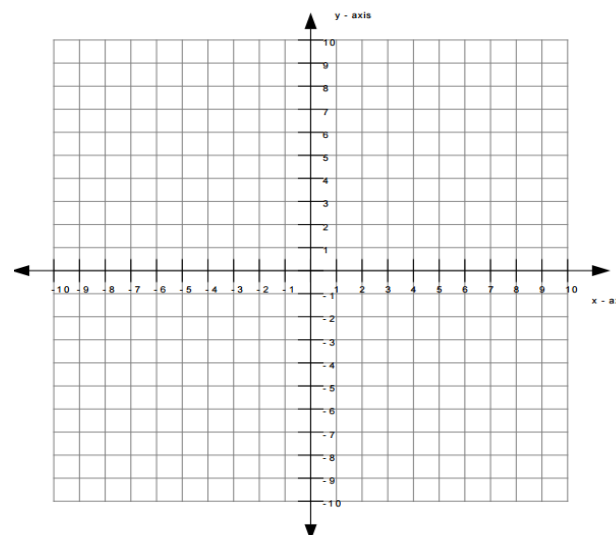
Equation: $y = 2x + 2$

(-1, _____)

F (2, _____)

(0, _____)

(3, _____)



GROUP 4

For each one, make the ordered pairs by substituting the given x-values to find y. Once that is completed, ask your teacher to check the pairs. Then, graph your points on the coordinate plane. Make a nice long line that goes through them all.

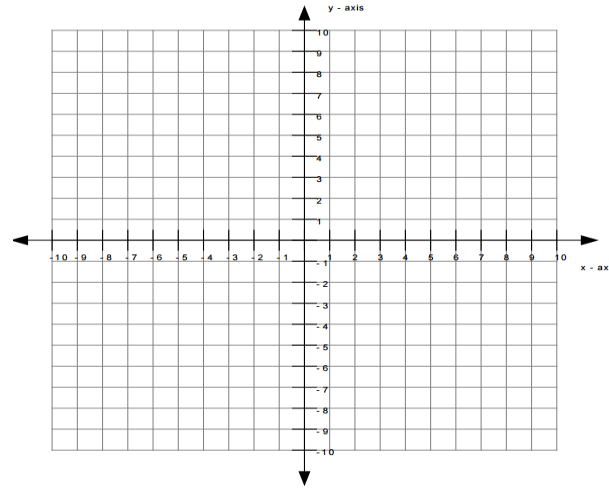
Equation: $y = 2x + 5$

(-1, _____)

A (-2, _____)

(0, _____)

(1, _____)



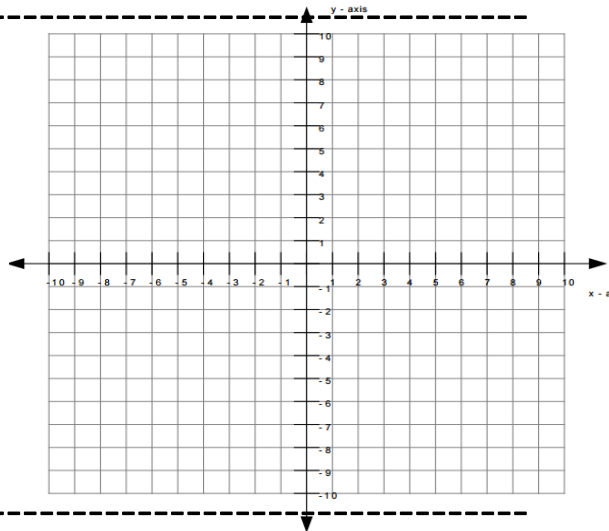
Equation: $y = -2x$

(1, _____)

B (-2, _____)

(-3, _____)

(3, _____)



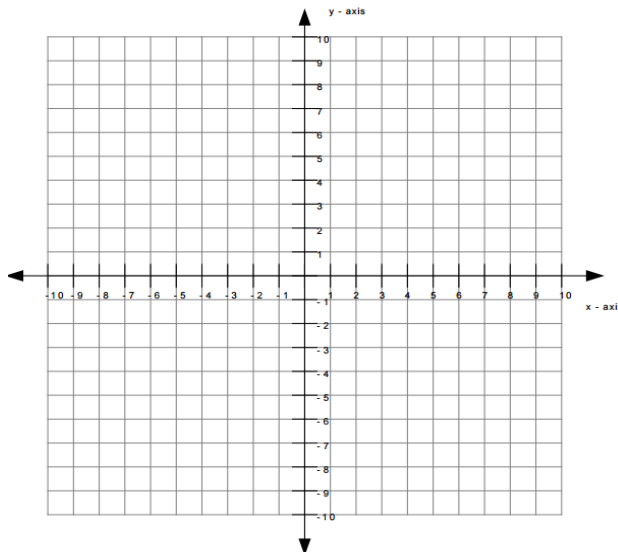
Equation: $y = 1x + 2$

(-1, _____)

C (2, _____)

(0, _____)

(3, _____)



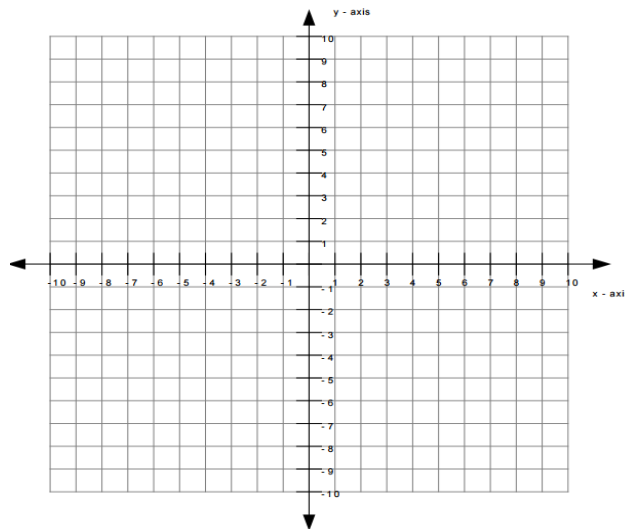
Equation: $y = 2x - 3$

(-1, _____)

D (2, _____)

(0, _____)

(3, _____)



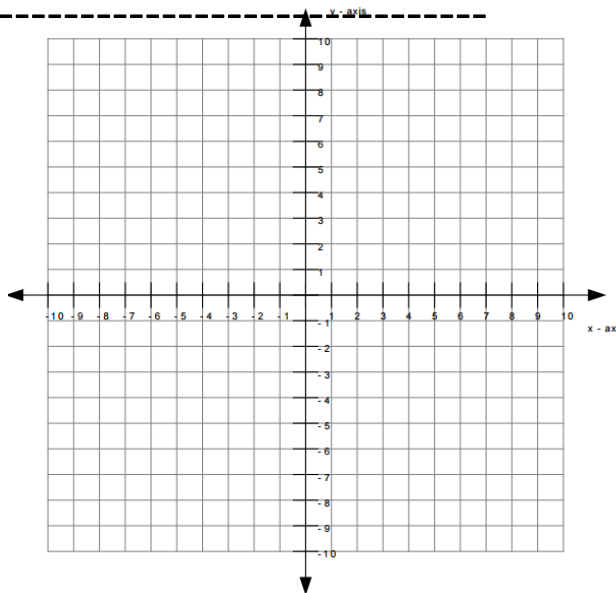
Equation: $y = -1x - 4$

(1, _____)

E (-2, _____)

(-3, _____)

(0, _____)



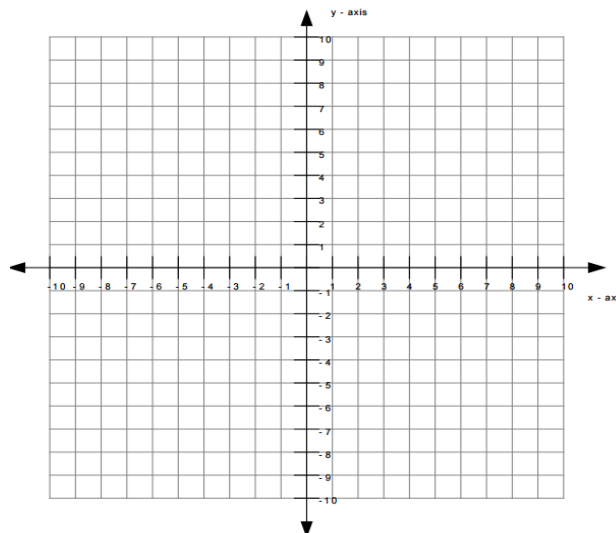
Equation: $y = 2x - 1$

(-1, _____)

F (2, _____)

(0, _____)

(3, _____)



GROUP 5

For each one, make the ordered pairs by substituting the given x-values to find y. Once that is completed, ask your teacher to check the pairs. Then, graph your points on the coordinate plane. Make a nice long line that goes through them all.

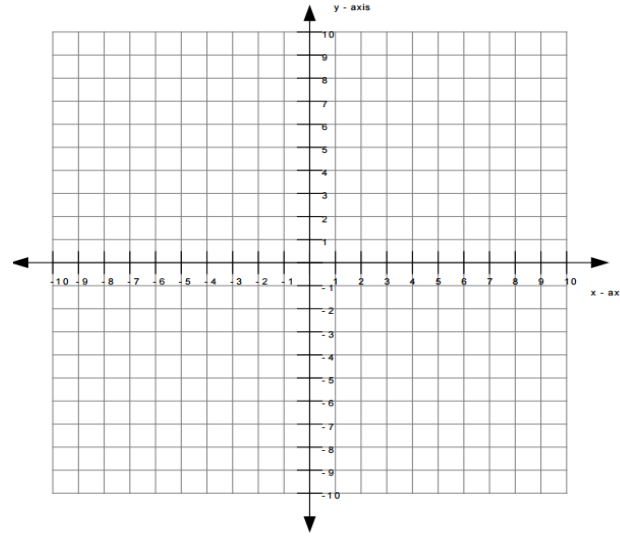
Equation: $y = -1x + 5$

(1, _____)

A (2, _____)

(0, _____)

(3, _____)



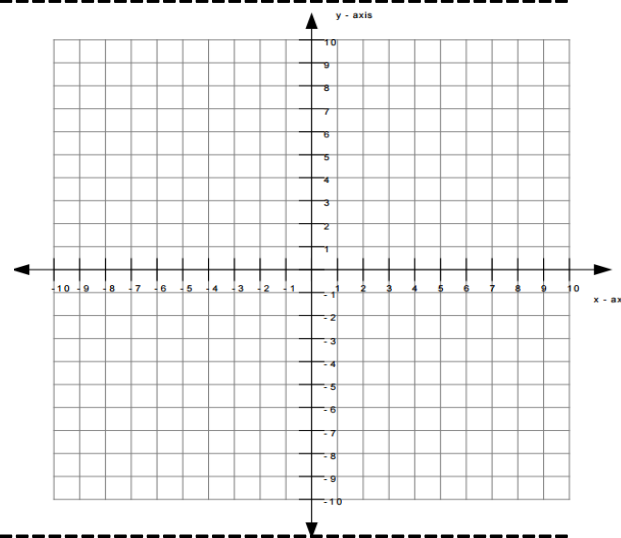
Equation: $y = -2x + 2$

(-1, _____)

B (-3, _____)

(0, _____)

(3, _____)



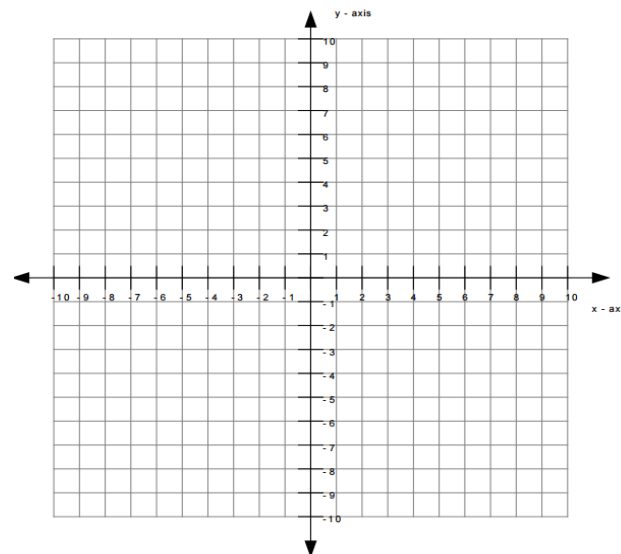
Equation: $y = x$

(-1, _____)

C (2, _____)

(0, _____)

(3, _____)



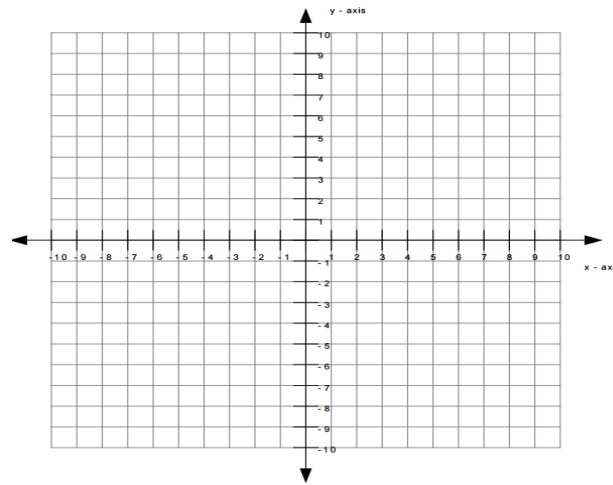
Equation: $y = -1x - 3$

(-1, _____)

D (-2, _____)

(0, _____)

(1, _____)



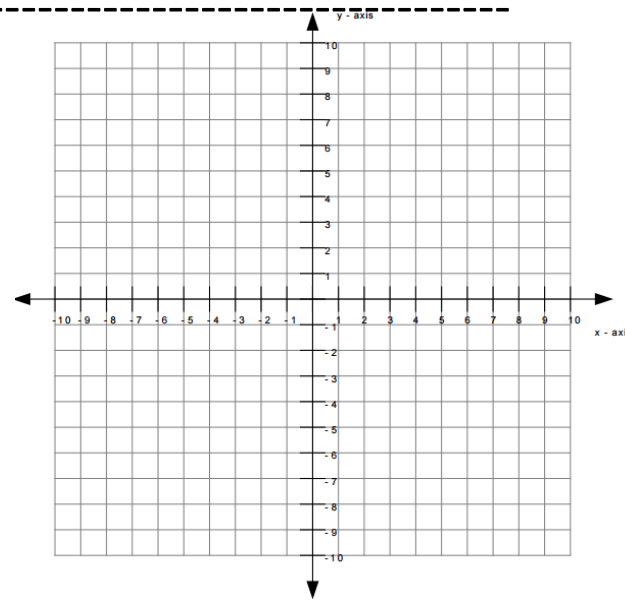
Equation: $y = -1x - 2$

(0, _____)

E (-2, _____)

(-3, _____)

(3, _____)



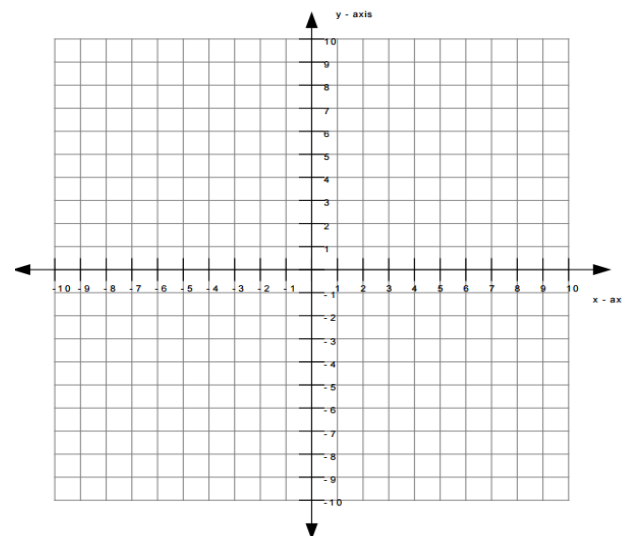
Equation: $y = 2x - 3$

(-1, _____)

F (2, _____)

(4, _____)

(5, _____)



Handout 2.4: Gallery Walk Reflection Sheet

Name: _____

Date: _____

1. Fill in the chart based on your observations.

Gallery Sheet:	How are all the graphs alike?	How are all the equations alike?	What do you think that tells you about graphing a line like $y = 3x + 4$?
A			
B			
C			
D			
E			
F			

2. Look at the graphs on Sheets B and E. How are they alike? _____ How are they different? _____
3. Look at the graphs on Sheets C and F. How are they alike? _____ How are they different? _____
4. What would you predict would be true about the graph $y = 3x + 4$?

For training or questions regarding this unit,
please contact:

exemplarunit@mdek12.org