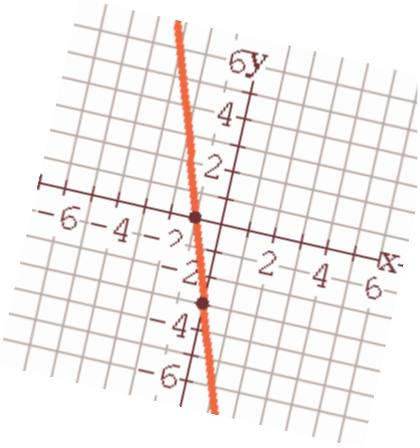
Algebra/Geometry Institute Summer 2006



Lesson Plan III: **A Slope or not a Slope? That is the Question!**
Faculty Name: *Tanya S. Castal*
School: *Coahoma County Junior High School Clarksdale, MS*
Grade Level: *8th*

1 Teaching Objective(s) *Lesson Plan designed for 3-5 days

The student will:

II (c): complete a function based on a given rule.
II (e): apply the principles of graphing in the coordinate system.
II (f): explore slope as a rate of change.

2 Instructional Activities

Begin the class by having students engage in the activity, *Life with the Wright Family.* (www.learnerslink.com/right_and_left.htm) Have students stand next to one another, forming a circle. Allow students to choose a piece of candy from a bag/basket and have them put it in their **right** hand. Then say,

*You are about to hear me read the story, 'Life with the Wright Family.' Every time you hear the word **right**, you are to pass the piece of candy to the person on your right. Every time you hear the word **left**, you are to pass the candy to the person on your left. Are there any questions?* Begin the activity!

Before introducing graphing linear functions, review students on identifying and explaining the following: **coordinate plane, x-axis, y-axis, point of origin, ordered pair (x-coordinate, y-coordinate**). Recall the *Wright Family* activity. Have students imagine that they are on a coordinate plane. Ask, *if you are on your coordinate plane, and you passed the candy to the right; would you be on the x-axis or the y-axis?* Have them explain their response. Ask students if the movement along the x-axis will be positive or negative. Make sure they give explanations for their answers.

Now have students review graphing linear equations. Place the following on the overhead: **(Transparency 1& 1A)**

$$2x + 2y = -2$$

Ask, *How do we solve this equation and graph it?* Have a student volunteer working this problem on the board. Once s/he is finished, discuss her/his answer with the class. Do they agree with the steps/procedures used? Then place transparency 2 back on the overhead. Walk through the steps with the class.

Step 1: Create a T table and have students give values for x-coordinates

X	Y

X	Y
-1	
0	
1	
2	

Step 2: Solve for the value of the y-coordinate.

X	2x + 2y = -2	Y
-1	2(-1) + 2y = -2 -2 + 2y - -2 $\frac{2y}{2} = \frac{0}{2}$	0
0	2(0) + 2y = -2 0 + 2y = -2 $\frac{2y}{2} = \frac{-2}{2}$	-1
1	2(1) + 2y = -2 2 + 2y = -2 $\frac{2y}{2} = \frac{-4}{2}$	-2
2	2(2) + 2y = -2 4 + 2y = -2 $\frac{2y}{2} = \frac{-6}{2}$	-3

Step 3: Graph the ordered pair on the coordinate plane. (Note: A graph paper transparency should be used. The teacher will have to initiate drawing the graph.)

To introduce slope to your students, ask for two volunteers to come to the front of the class. Have one student (Student A) sit in a chair (located to the right of you). Have the other student (Student B) stand to the left of you. Ask Student A to stand up and sit down in the chair. Say, ***See Student A. Can we say that s/he is rising from the chair?*** Have student A to sit. Ask, ***Is student A declining when s/he sits down?*** Then have Student B to run in place. Instruct Student B to run forward and backward. Ask, ***Can Student B run any other way besides running forward or backward?*** (Note: some may say run in a diagonal, but ask isn't that still running forward?) At this point define a **slope.** Relate what they have just witnessed to what a slope is/does. Introduce notes on the types of slopes**. (Transparency 2& 2A)**

Demonstrate how to calculate the slope. Place the following on the overhead. **(Transparency 3)**

To calculate the slope of a linear function, show the equation used:

Slope (m) = <u>difference in y-coordinate</u>
difference in x-coordinate

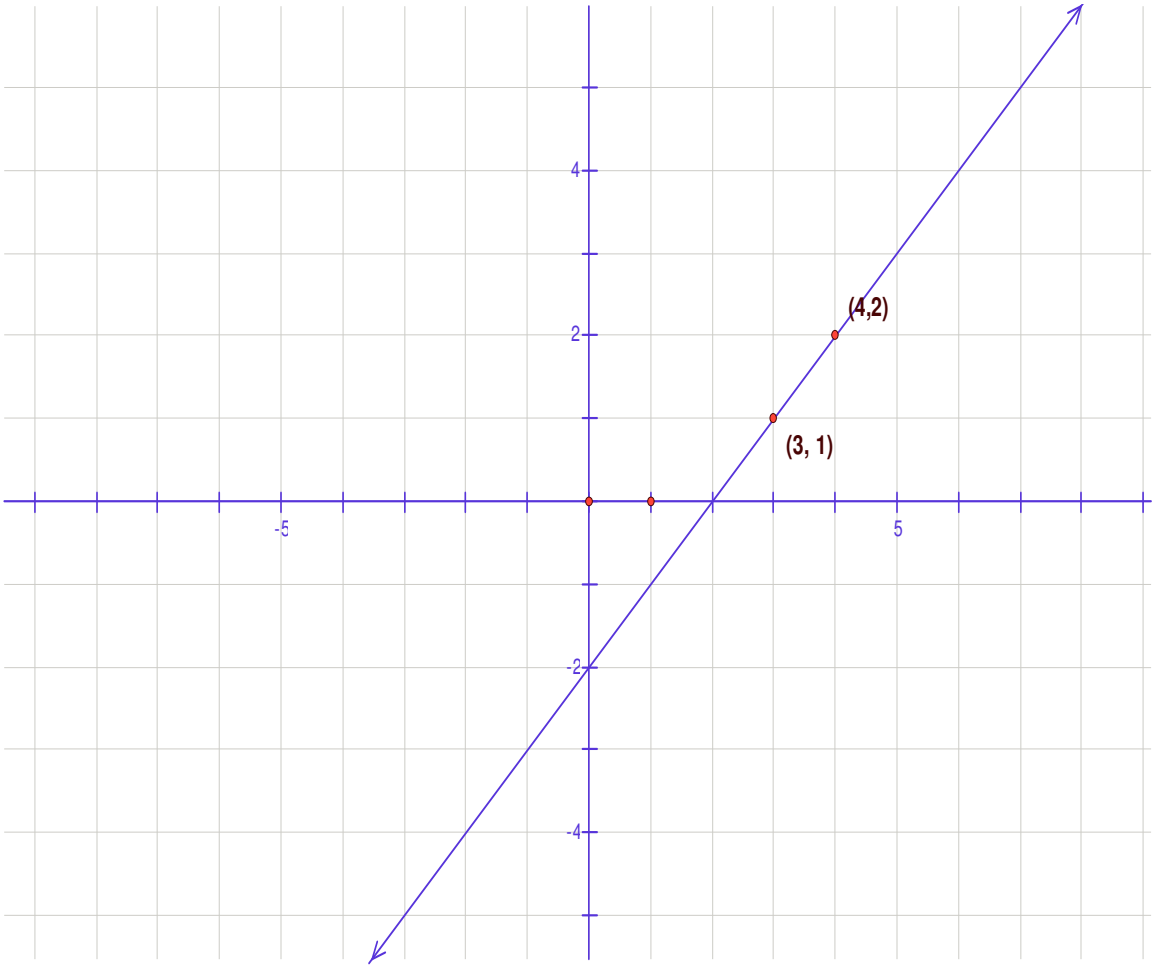
$$\mathbf{m} = \frac{y_2 - y_1}{x_2 - x_1}$$

If the coordinate A (4,2) and B (3,1) are given, can you find the slope?

$$\mathbf{m} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1-2}{3-4} = \frac{-1}{-1}$$

$$\mathbf{m = 1}$$

Show students what the graph looks like. Draw attention to the positive direction of the slope. **(Transparency 4)**

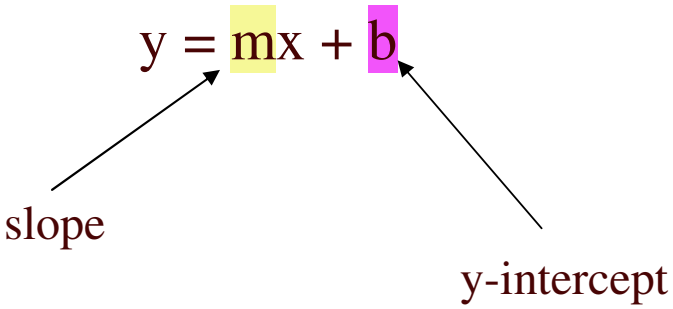


Once students are comfortable with solving for the slope, ask if the slope is positive or negative? How do you know? What does it mean?

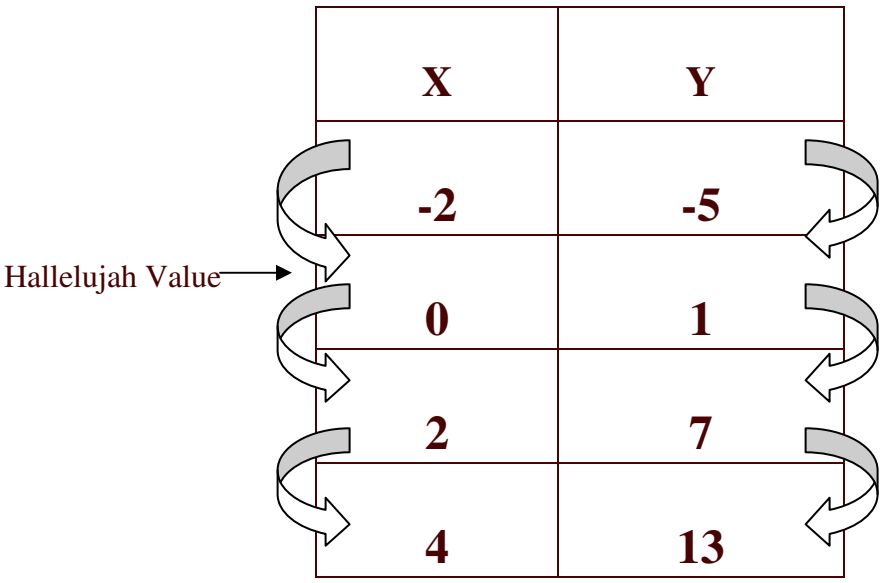
Now have students take out their graphing calculators to find/determine slopes of linear functions. Using the overhead graphing calculator, demonstrate creating a graph for $y = 2x + 2$, $y + 2x = 3$, $y = 2x - 1$. Bring attention to the similarities in each line. Ask is the slope positive or negative? Try $y = -3x + 1$, $y = -3x + 3$, $y = -3x - 2$. Is the slope positive or negative? How do you know?

Introduce the y-intercept by placing **Transparency 1A** back on the overhead projector. Ask: *At what point did the line intersect the y-axis?* Draw attention to (0, -1). Identify that point as the y-intercept. Make sure to stress the y-intercept as the point where the line crosses the y-axis.

Understanding how to calculate the slope and how to identify the y-intercept is necessary to write rules for linear function. Inform students that a rule is an equation that describes the function. The rule/equations is f(x) = mx + b, but it is generally seen as y = mx + b.



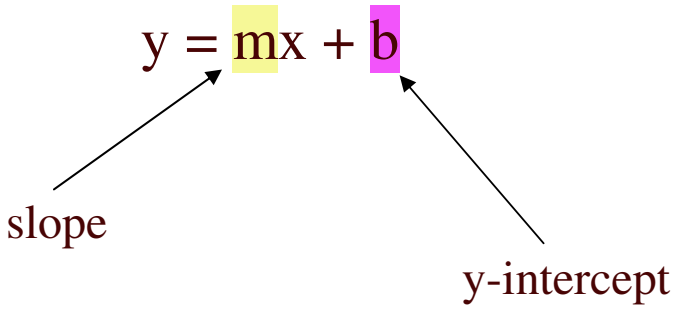
In order to write the equation, look for a specific pattern in the x-coordinates and the y-coordinates (of ordered pairs as they relate to the slope. Place the following on the overhead projector. (**Transparency 5**)



Bring attention to the pattern of the x-coordinate. Notice how the value of x increases by 2. Bring attention to the pattern of the y-coordinate. Notice how the value of y increases by 6. This pattern can be represented in the slope equation:

$$m = \frac{6}{2} = 3$$

Explain that the "hallelujah value" is given to zero in the x-coordinate because it will always represent the point where the line crosses the y-axis or the y-intercept. With all information computed and provided, write the rule for this linear function.



$$y = mx + b$$

$$= 3x + 1$$

A good activity that reinforces the concept of identifying slope and writing linear functions is Height vs. Shoe Size (http://goals2000mathematics.truman.edu/modexam.html). Discuss the findings as a group.

A great activity for finding slopes using the graphic calculator is Spaghetti Bridges activity (http://fcit.usf.edu/math/lessons/activities/spaghiT.htm).

3 Materials and Resources

- Overhead projector/ markers
- Student portfolio
- Graphing calculator (Overhead/Teacher)
- Student graphing calculator
- Paper cups
- Pennies (100 coins per group)
- Large packages of uncooked spaghetti
- Small pieces of candy

4 Assessment

Observation/Student Participation
Student Portfolio
Spaghetti Bridges Activity
Height vs. Shoe Size Activity

Transparency 1

$2x + 2y = -2$

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Transparency 1A

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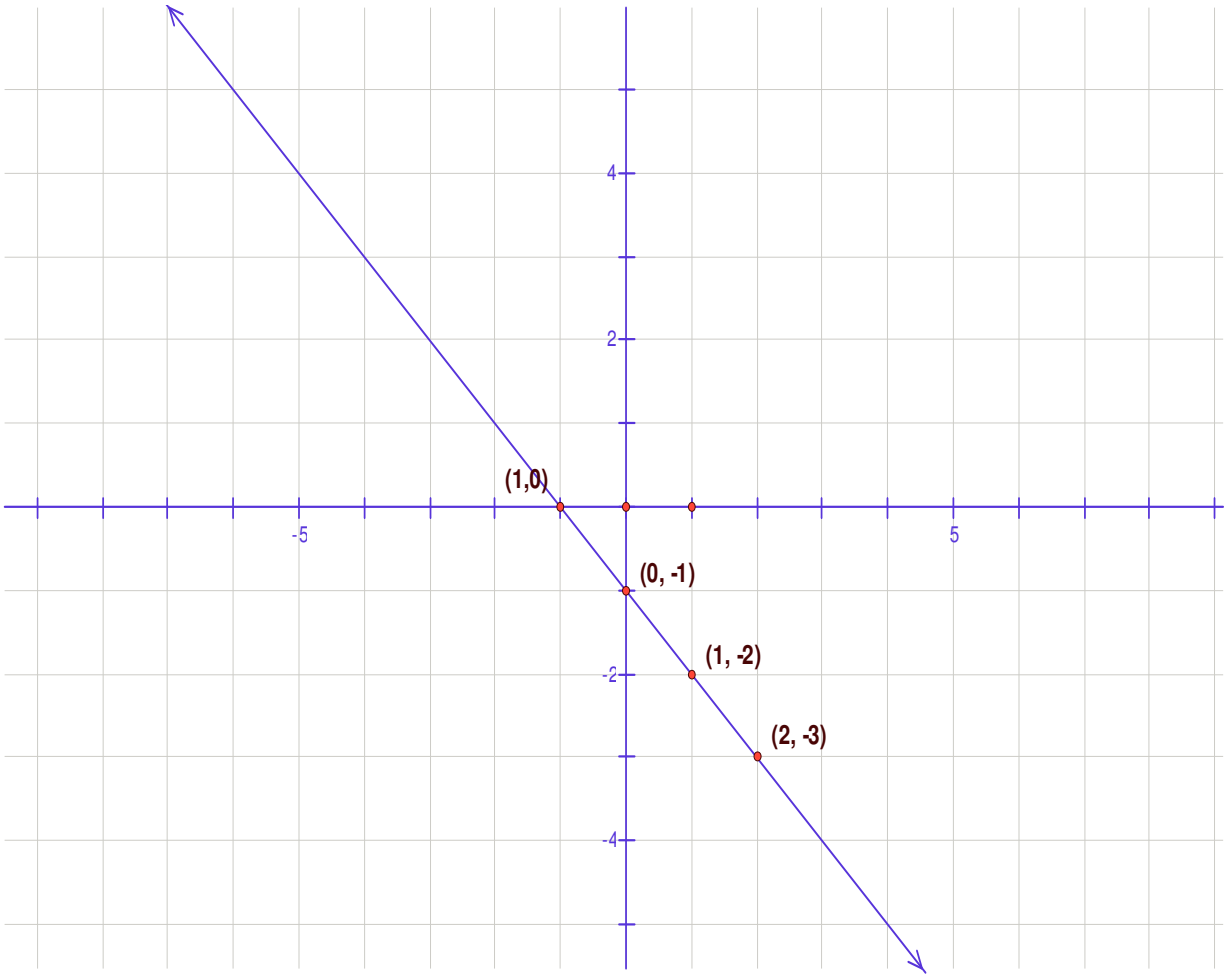
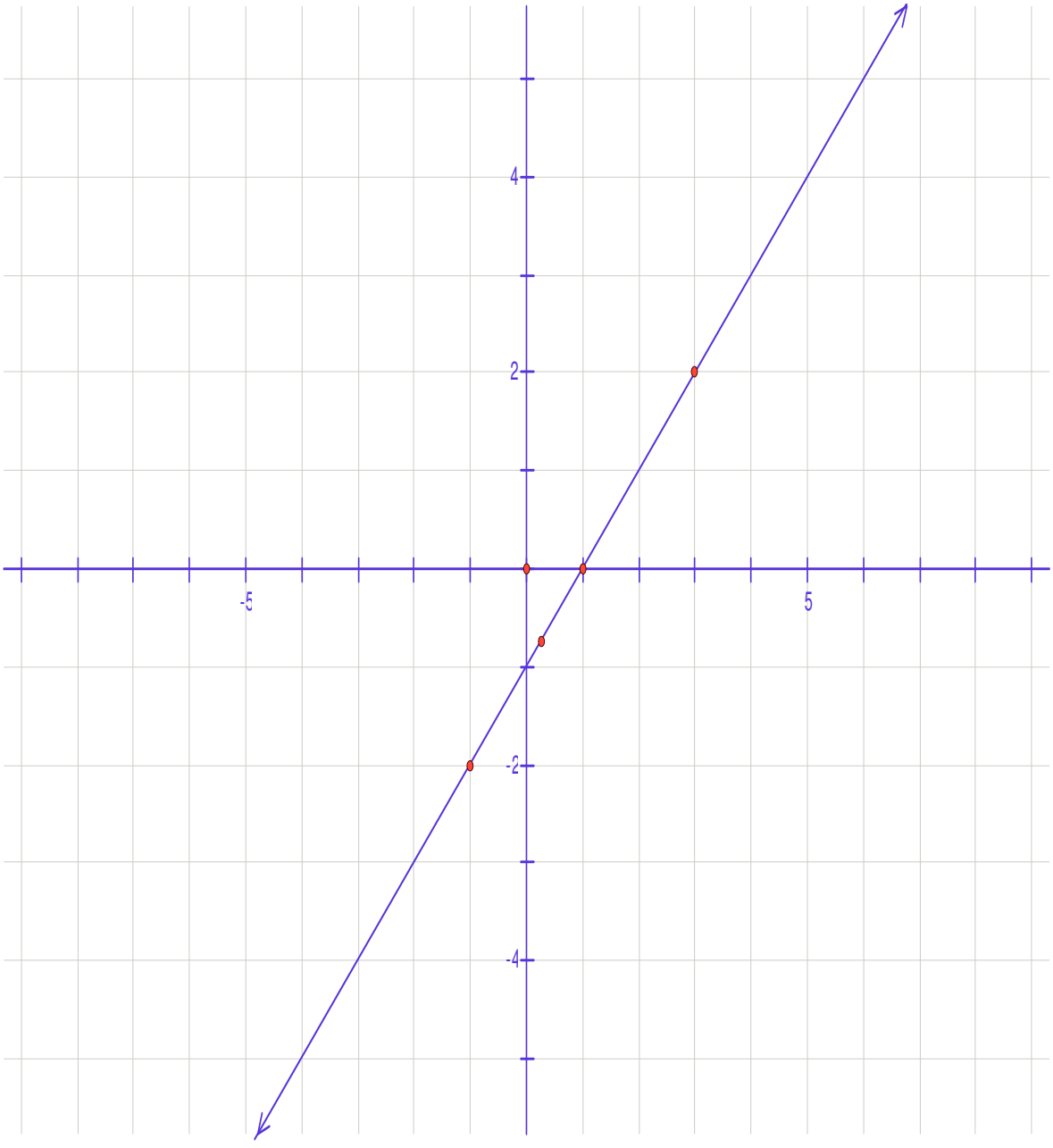


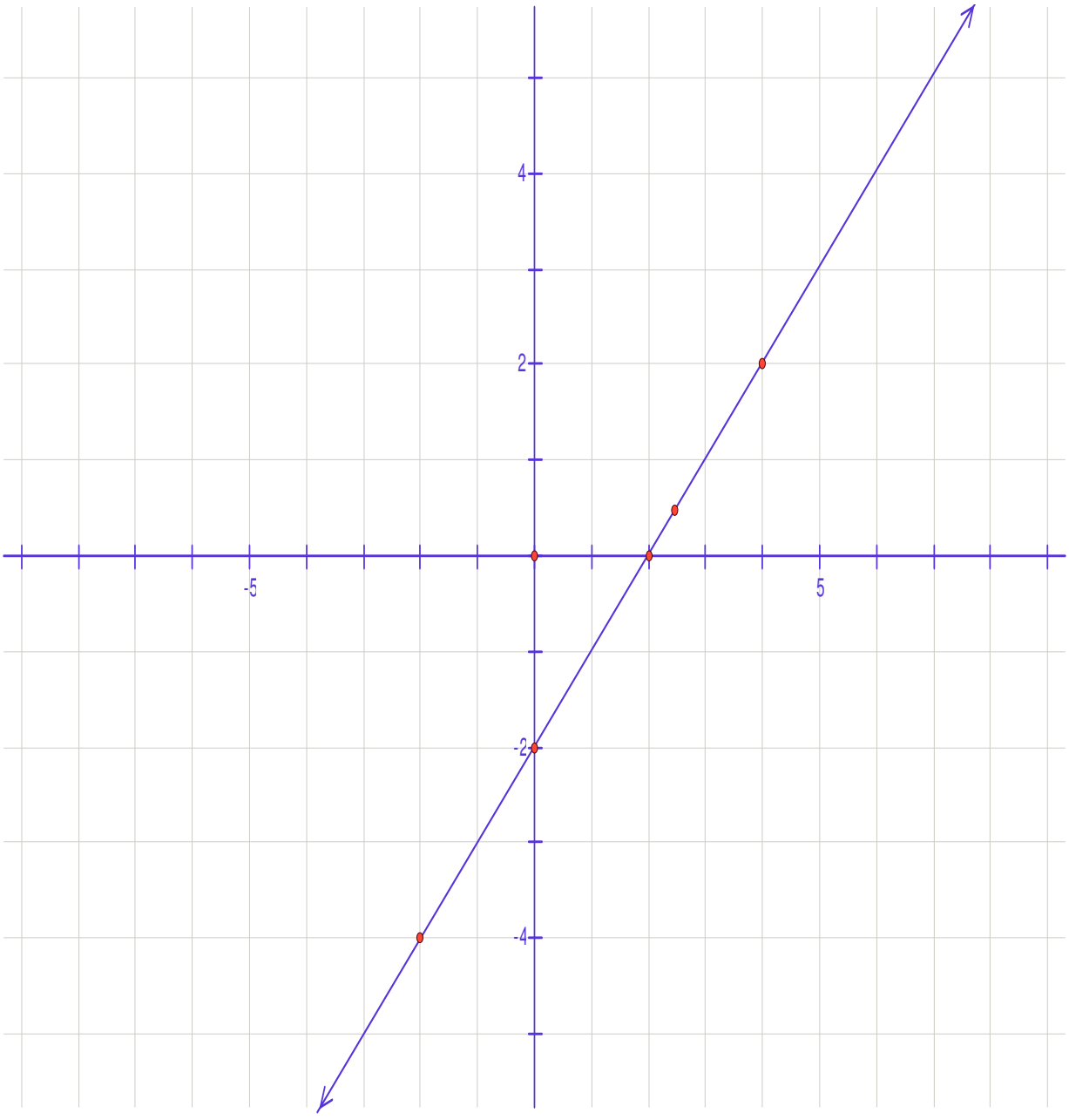
Transparency 2

Positive Slope



Transparency 2A

Negative Slope



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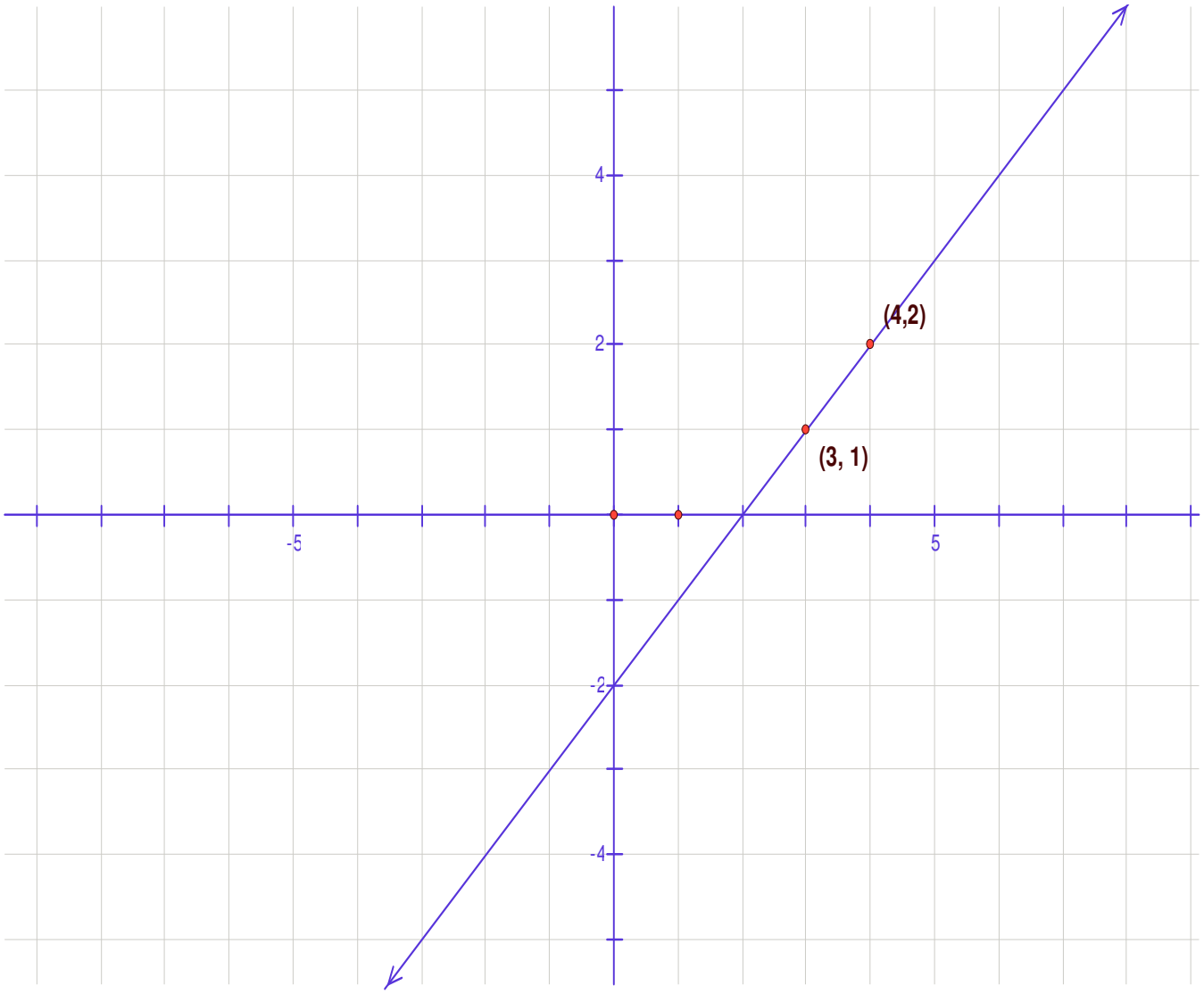
Transparency 4



Transparency 5

$$y = mx + b$$

slope

y-intercept

X	Y
-2	-5
0	1
2	7
4	13

Hallelujah Value