

Name _____

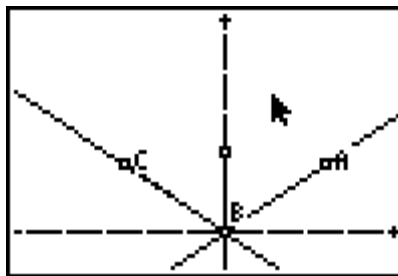
Absolutely Wonderful!

The purpose of this lesson is to investigate properties of absolute value functions.

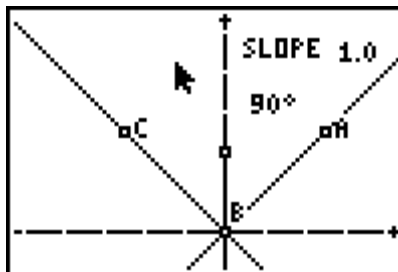
Question: Is there a relationship between the angle created by the branches of an absolute value function and the slope of each branch of the function?

Use Cabri Jr. to investigate this question.

- Step 1: Turn the Axes on by pressing **F5**, selecting **Hide/Show**, and arrowing over to **Axes**.
- Step 2: Construct a line through the origin by pressing **F2** and selecting **Line**. Move the cursor to the origin and press **ENTER**. Finally, move the cursor to a location in the 1st quadrant and press **ENTER** again.
- Step 3: Construct a reflection of this line over the y-axis. To do this, press **F4** and select **Reflection**. The arrow cursor will change to a pencil cursor. Use the pencil cursor to highlight the y-axis (it will flash when the cursor is near), press **ENTER**, then select the line by moving the cursor to the line and pressing **ENTER**.
- Step 4: Measure the angle labeled ABC in the picture below. To measure the angle, choose **Measure** from the **F5** menu and arrow over to **Angle**. Select the 3 points that define this angle, making sure the vertex of the angle is selected second.



- Step 5: Finally, measure the slope of the line passing through the 1st quadrant by choosing **Measure** from the **F5** menu and arrow over to **Slope**.

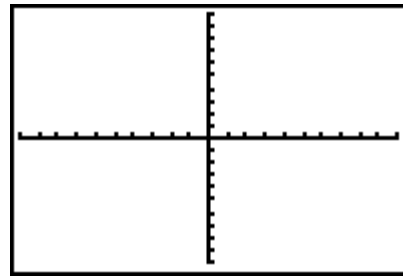


With Navigator...

Step 6: Enter your data points into Activity Center. Load the slope values into the list titled, "Slope" and load the measures of the angle between the branches of the absolute value function into the list titled, "Angle." When finished, press **SEND**.

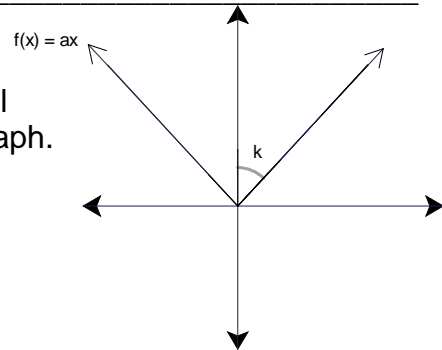
SLOPE	ANGLE		
-1	90		
1	90		
2	54		
-2	54		
3	36		
-3	36		
SLOPE(1) = -1			
(<F00)			

Question #1: Draw your prediction of the graph. Give a reason for your prediction.



Question #1: Is there a relationship between the angle created by the branches of an absolute value function and the slope of each branch of the function? How do you know a relationship exists?

Step 9: Write a function that models the data. To help you begin, determine a useful label for the angle marked k in the graph.



Step 10: Create a right triangle with the right branch of the function find an angle congruent to the angle k .

Question 2: Why are those 2 angles congruent?

Step 11: Write a trigonometric function that will give you the measure angle k .

Step 12: Rewrite the function so that the equation can be used to determine the angle between the branches of an absolute value function.

Question 3: Determine the angle measures between the branches of an absolute value function from the following equations.

a) $f(x) = |8x|$

b) $f(x) = |1/3x|$

Question 4: Do vertical and/or horizontal translations of an absolute value function change the relationship between the slopes of the branches and the angle between the branches? Explain your thinking.

Without Navigator...

Step 6: Use your graphing calculator to investigate this data. Begin by changing the Angle setting to **Degree** on the **MODE** menu.

Step 7: Load the values of the slope into L1 and the measures of the angle created between both branches of the function into L2.

L1	L2	L3	3
1	90		
-1	90		
2	44		
-2	44		
3	66		
-3	66		
4	28		

L3(1)=

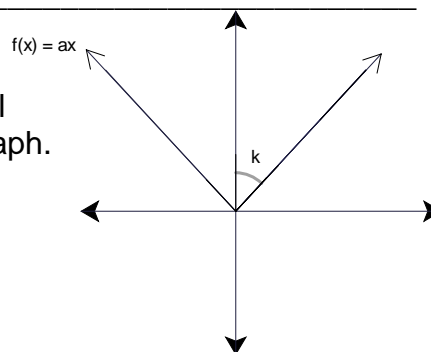
Step 8: Create a scatter plot of the data. Use this window to view the graph.

```

WINDOW
Xmin=-6
Xmax=6
Xscl=1
Ymin=-1
Ymax=180
Yscl=1
Xres=1
    
```

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