

Transformationally Speaking

Reporting Category Equations and Inequalities

Topic Identifying patterns in families of graphs and their equations

Primary SOL A.6b The student will graph linear equations and linear inequalities in two variables, including writing the equation of a line when given the graph of the line, two points on the line, or the slope and a point on the line.

Related SOL A.6a, A.7d

Materials

- Graphing calculators

Vocabulary

transformation, translation, reflection (earlier grades)

slope, slope-intercept form, x-intercept, y-intercept (A.6)

parent function, function families (A.7)

Student/Teacher Actions (what students and teachers should be doing to facilitate learning)

1. Have students build a table of values for $y = x$ and graph the points on the graphing calculator, as follows:
 - Graph Set 1, including the parent graph $y = x$, on the calculator. What do you observe?

$$\text{Set 1} \begin{cases} y_1 = x \\ y_2 = x + 1 \\ y_3 = x + 2.4 \\ y_4 = x + 6 \end{cases}$$

- Graph Set 2 on the calculator. What do you observe?

$$\text{Set 2} \begin{cases} y_1 = x \\ y_2 = x - 0.6 \\ y_3 = x - 2.1 \\ y_4 = x - 9 \end{cases}$$

- Consider the equation $y = x + c$. What is the effect of c on the graph of $y = x$? What kind of transformation is this?
- Graph Set 3 on the calculator. What do you observe?

$$\text{Set 3} \begin{cases} y_1 = x \\ y_2 = 1.6x \\ y_3 = 2x \\ y_4 = 3.4x \end{cases}$$

- Graph Set 4 on the calculator. What do you observe?

$$\text{Set 4} \begin{cases} y_1 = x \\ y_2 = 0.9x \\ y_3 = 0.5x \\ y_4 = 0.1x \end{cases}$$

- Consider the equation $y = ax$. What is the effect of a on the graph of $y = x$? Which transformation is this?
- Graph Set 5 on the calculator. What do you observe?

$$\text{Set 5} \begin{cases} y_1 = x \\ y_2 = -x \end{cases}$$

- Graph Set 6 on the calculator. What do you observe?

$$\text{Set 6} \begin{cases} y_1 = 0.5x \\ y_2 = -0.5x \end{cases}$$

- Consider the equation $y = -ax$, when $a > 0$. What is the effect of $-a$ on the graph of $y = x$? Which transformation is this?
- Graph Set 7 on the calculator. What do you observe?

$$\text{Set 7} \begin{cases} y_1 = 0.5x + 2 \\ y_2 = -0.5x + 2 \\ y_3 = -(0.5x + 2) \end{cases}$$

- Consider the equation $y = -a(x + b)$, when $a > 0$. What is the effect of b on the graph of $y = x$? Which transformation is this?

Assessment

- Questions**

Using the parent function $y = ax + b$,

- change the a , and describe this transformation.
- change the b , and describe this transformation.
- graph your family of functions.

- Journal/Writing Prompts**

- Describe the effect of a on a linear equation of $y = ax + b$.
- Describe what would happen with $y = ax + b$ if $a = 0$.

Strategies for Differentiation

- Have students stand and use their arms to represent transformations (use arms to represent the slope of a line).