

Objective

By the end of this lesson, the student will understand how to transform linear functions through various operations such as translation, reflection, and dilation. The student will be able to apply these transformations to create new linear functions and interpret their effects on the graph.

Materials and Prep

- Pencil and paper
- Graph paper (optional but helpful)
- Calculator (if needed for complex calculations)
- Knowledge of basic linear functions ($y = mx + b$)

Activities

- **Graphing Linear Functions:** Start by graphing the basic linear function $y = 2x + 1$ on graph paper. Once the student is comfortable, ask them to choose a transformation (e.g., shifting up by 3) and graph the new function. Discuss how the graph changes with each transformation.
- **Transformation Challenge:** Create a list of different transformations (e.g., reflect over the x-axis, translate left by 2, etc.). Have the student pick a transformation and apply it to the function $y = -x + 4$, then graph the result. Encourage them to explain what they did and how it affected the graph.
- **Real-World Applications:** Ask the student to think of a real-world scenario that can be modeled by a linear function. Have them create a function based on that scenario and then apply a transformation. For example, if they choose a function representing distance over time, discuss how a transformation might represent a change in speed.

Talking Points

- "A transformation of a linear function can change its position, slope, or both. Let's explore how each transformation affects the graph."
- "When we translate a function, we are shifting it up, down, left, or right. How does this change the y-intercept?"
- "Reflecting a function over the x-axis will change the sign of the slope. Can you see how that flips the graph?"
- "Dilation affects the steepness of the line. If we multiply the slope by a factor greater than 1, what happens to the graph?"
- "Every transformation has a real-world application. Can you think of a situation where a linear function might change?"