

Using Transformations to Graph Linear Functions

Learning Goals

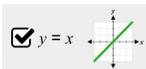
- Identify and use a vertical shift to graph a linear function.
- Identify and use a vertical stretch or compression to graph a linear function.
- Combine transformations to graph a linear function.



=turn and talk. Stop and share your responses with your partner.

Activity

1. **Explore** the slope-intercept screen for 5 minutes and think of 1-3 questions or observations.



2. Check the “ $y = x$ ” checkbox and play around with the sim. A linear parent function is the equation $y = x$. How would you describe the linear parent function, $y = x$?



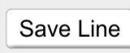
3. Graph the equations on the same screen. Hit “save line”  after each line.

Function	How is the parent function transformed? Check any that apply.
$y = x + 6$	<input type="checkbox"/> shifts up <input type="checkbox"/> shifts down <input type="checkbox"/> more steep <input type="checkbox"/> less steep
$y = x + 3$	<input type="checkbox"/> shifts up <input type="checkbox"/> shifts down <input type="checkbox"/> more steep <input type="checkbox"/> less steep
$y = x - 3$	<input type="checkbox"/> shifts up <input type="checkbox"/> shifts down <input type="checkbox"/> more steep <input type="checkbox"/> less steep
$y = x - 6$	<input type="checkbox"/> shifts up <input type="checkbox"/> shifts down <input type="checkbox"/> more steep <input type="checkbox"/> less steep

How does changing the value of b transform the graph of an equation in the form $y = mx + b$?



4. Erase the lines  and graph the equations below on the same screen. Hit “save line”

 after each line.

Function	How is the parent function transformed? Check any that apply.
$y = \frac{1}{2}x$	<input type="checkbox"/> shifts up <input type="checkbox"/> shifts down <input type="checkbox"/> more steep <input type="checkbox"/> less steep <input type="checkbox"/> reflection
$y = 2x$	<input type="checkbox"/> shifts up <input type="checkbox"/> shifts down <input type="checkbox"/> more steep <input type="checkbox"/> less steep <input type="checkbox"/> reflection
$y = -2x$	<input type="checkbox"/> shifts up <input type="checkbox"/> shifts down <input type="checkbox"/> more steep <input type="checkbox"/> less steep <input type="checkbox"/> reflection
$y = -\frac{1}{2}x$	<input type="checkbox"/> shifts up <input type="checkbox"/> shifts down <input type="checkbox"/> more steep <input type="checkbox"/> less steep <input type="checkbox"/> reflection

How does changing the value of m transform the graph of an equation in the form $y = mx + b$?



5. Erase the lines and graph the equations, $y = 2x + 5$ and $y = -2x + 5$ on the same screen. How does changing the sign of m transform the graph of the equation?



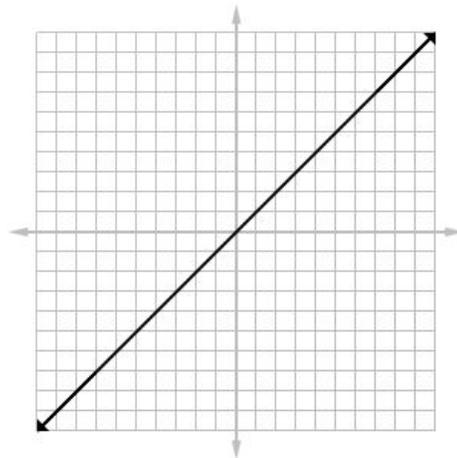
6. Erase the lines . Use the sim to find the equation of each graph below. Describe how each line transformed.

<p>Equation: _____</p> <p><input type="checkbox"/> shifts up <input type="checkbox"/> shifts down <input type="checkbox"/> more steep <input type="checkbox"/> less steep</p>	<p>Equation: _____</p> <p><input type="checkbox"/> shifts up <input type="checkbox"/> shifts down <input type="checkbox"/> more steep <input type="checkbox"/> less steep</p>	<p>Equation: _____</p> <p><input type="checkbox"/> shifts up <input type="checkbox"/> shifts down <input type="checkbox"/> more steep <input type="checkbox"/> less steep</p>
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7. Without using the sim, graph $y = \frac{1}{2}x - 3$ using transformations.

Describe the transformations to the parent function.

Do you have to sketch the graph in the order of the transformation? What happens if you sketch it out of order?



How would you tell another student to graph using transformations?

8. Summary. *Fill in the blanks.*

The graph gets **less steep** when the slope is between ____ and _____. This is called a **vertical compression** of the parent function. The graph gets **more steep** when the slope is _____ than 1. This

is called a **vertical stretch** of the parent function. **Reflections** happen when the slope is _____.

Vertical shifts happen when the y-intercept is not equal to _____.