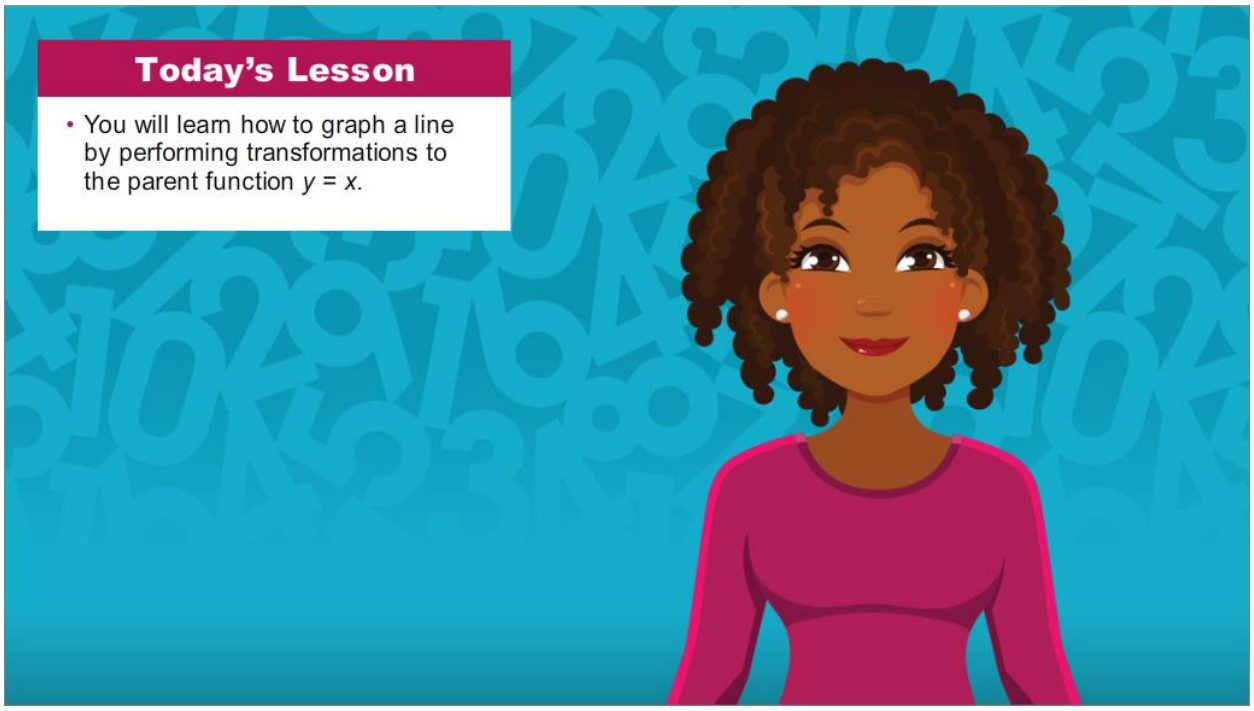
Module 8: Graphing Linear Equations

Topic 3 Content: Graphing Transformations of the Parent Function

Introduction

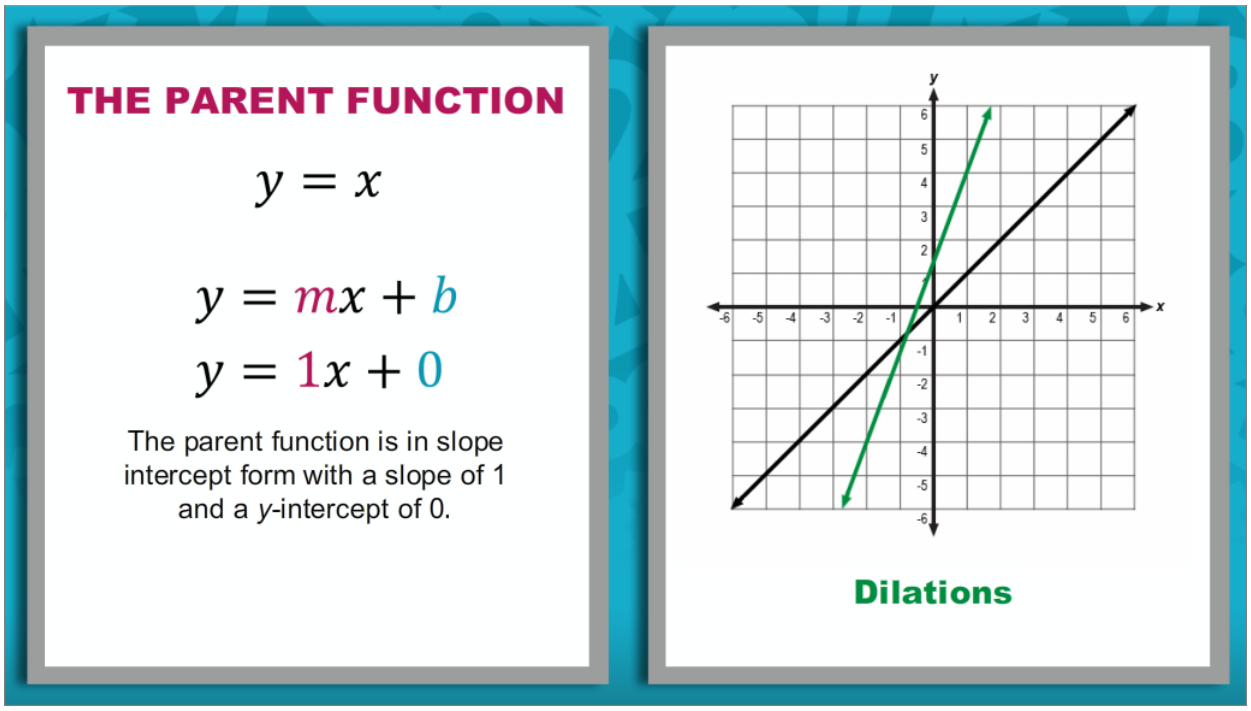


Hi there! I'm so glad you could join me for this lesson in Algebra I. In this lesson, you will learn how to graph a line by performing transformations to the parent function $y = x$.

Module 8: Graphing Linear Equations

Topic 3 Content: Graphing Transformations of the Parent Function

The Parent Function

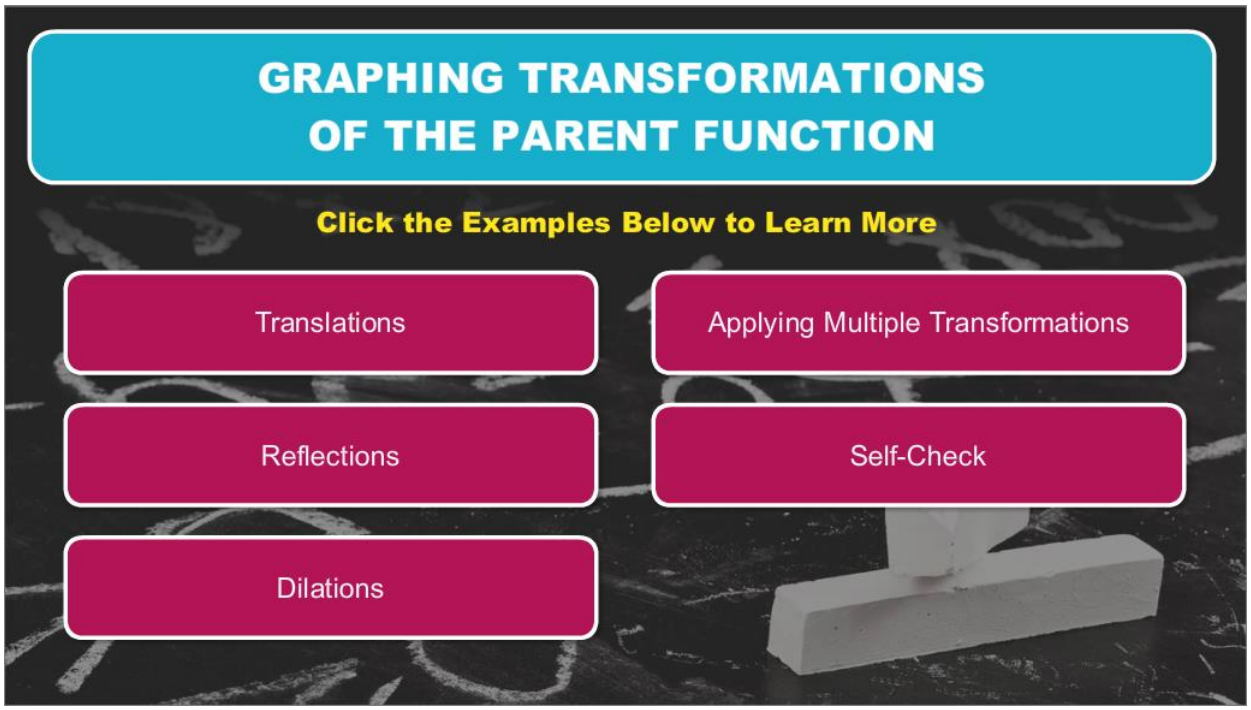


Notice that the parent function $y = x$ is in slope-intercept form; the slope is 1 and the y-intercept is 0. Other members of the family of graphs of linear functions can be created by transforming the parent funcion.

The transformations you will explore in this topic are:

- translations;
- reflections;
- and dilations.

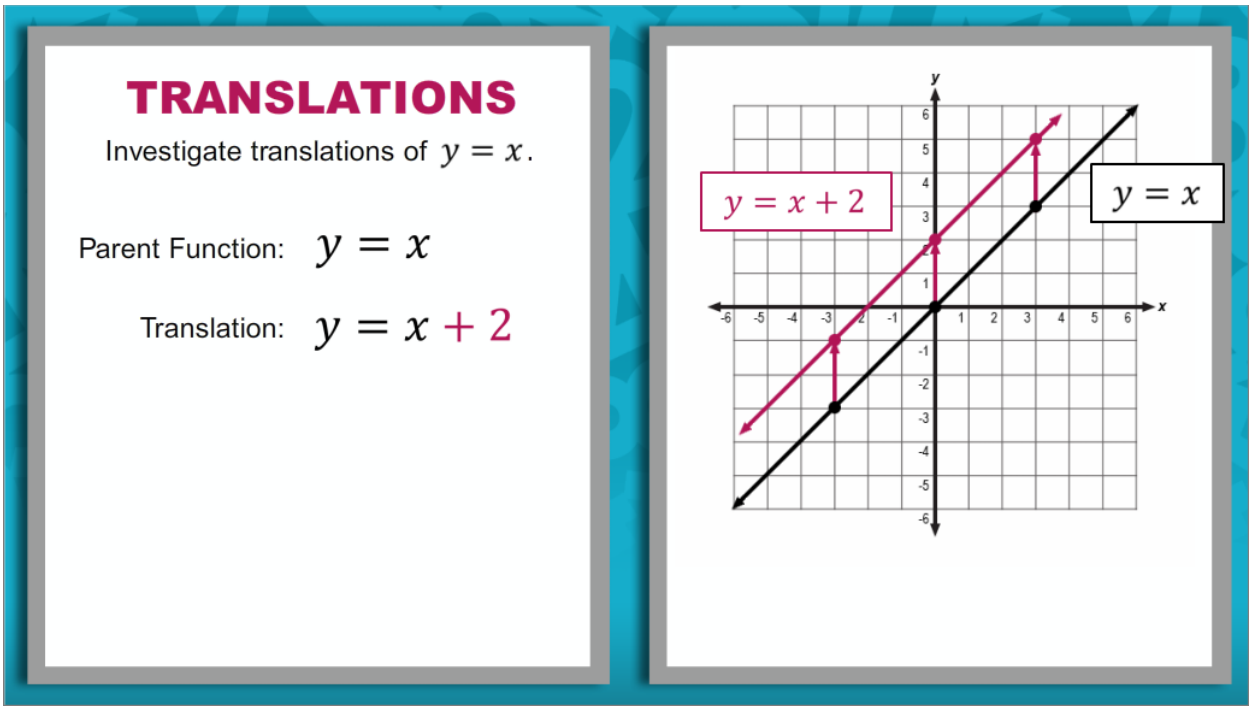
Graphing Transformations of the Parent Function



Click the examples below to learn more.

- Translations
- Reflections
- Dilations
- Applying Multiple Transformations
- Self-Check

Example 1: Translations



Investigate translations of $y = x$.

Adding a value to the parent function results in the graph of $y = x$ moving up.

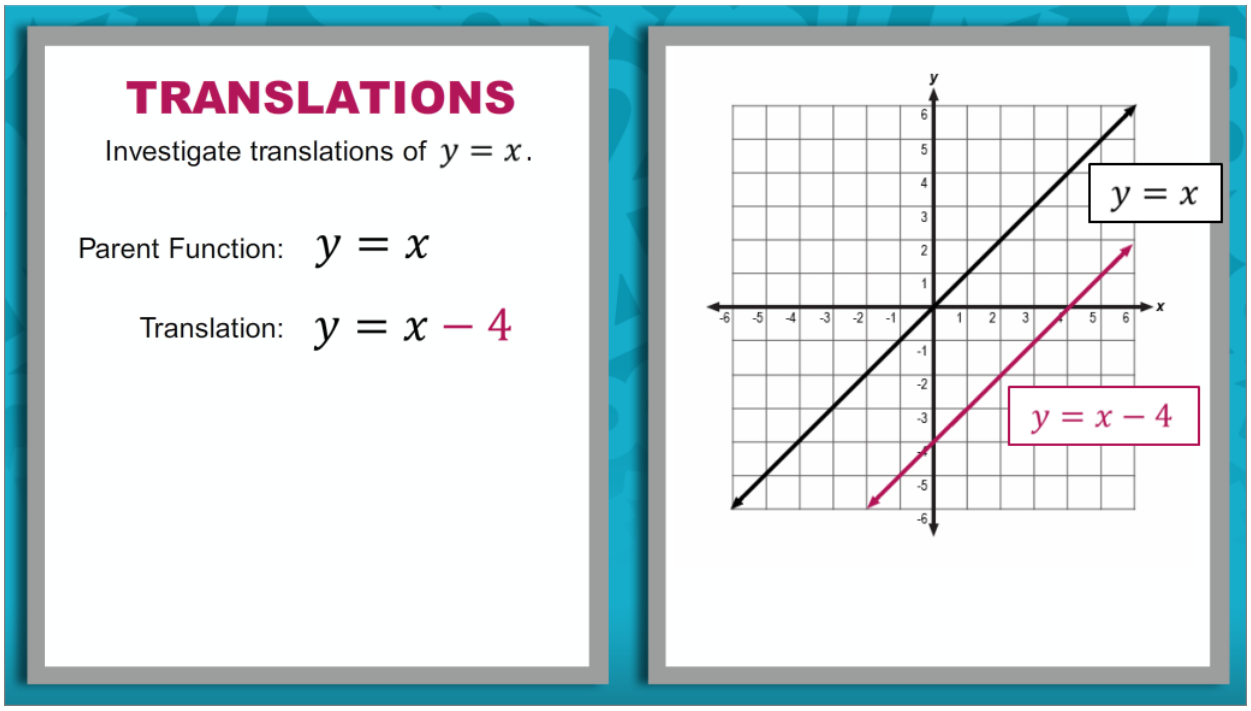
Subtracting a value results in the graph moving down.

Consider the linear equation $y = x + 2$.

The value, 2, was added to the right side of the equation. As a result, the parent function was shifted two units up.

More specifically, each point on the line $y = x$ was shifted two units up.

Example 1: Translations (continued)

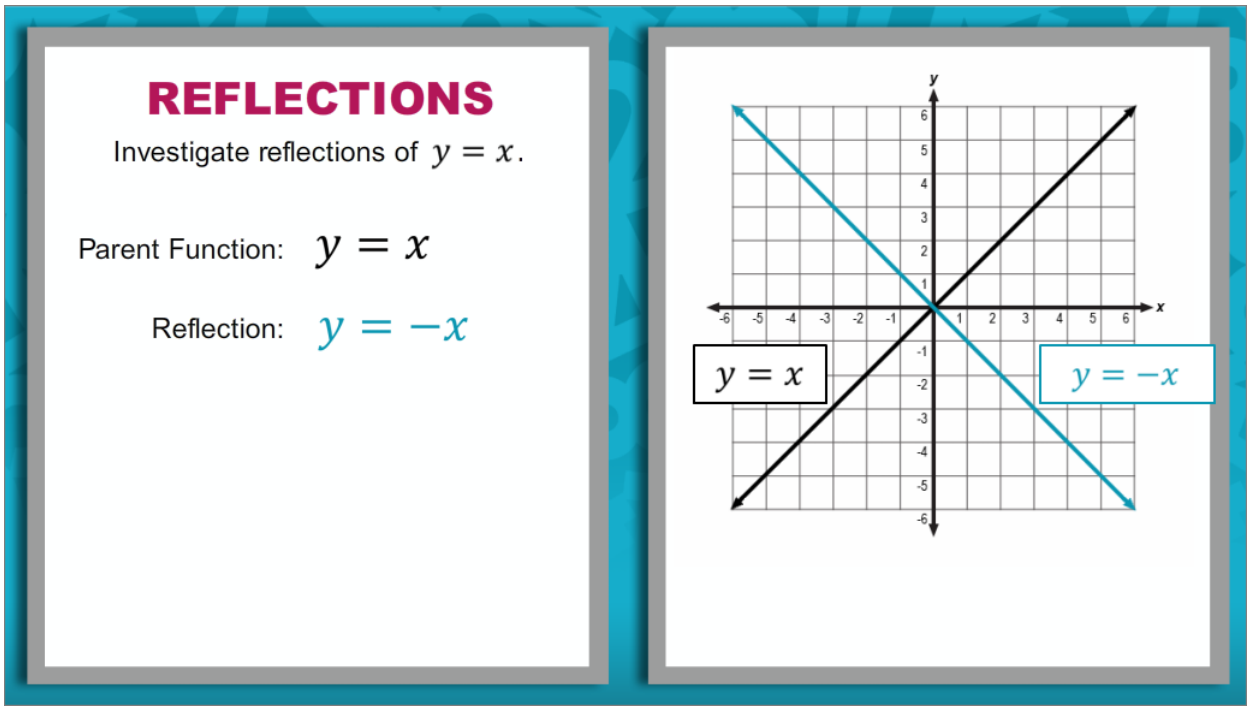


Investigate translations of $y = x$.

Now consider the linear equation $y = x - 4$.

Four was subtracted from the right side of the equation. As a result, the parent function was shifted four units down.

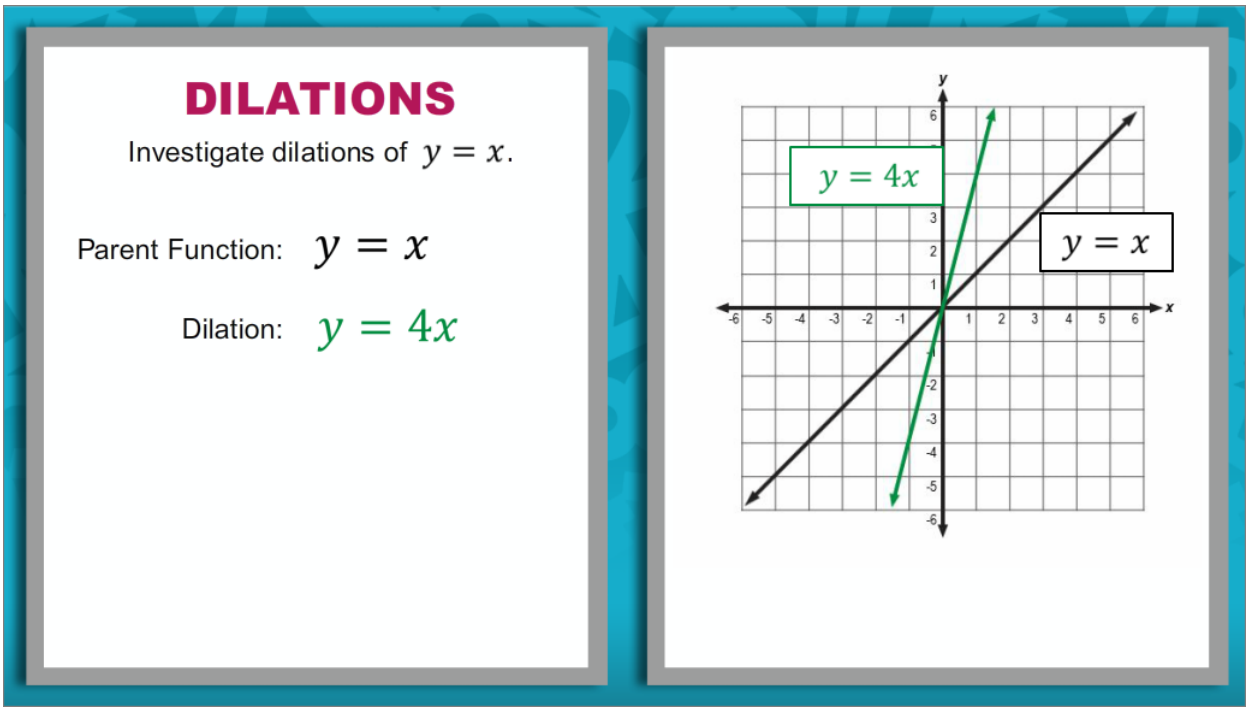
Example 2: Reflections



Investigate reflections of $y = x$.

Changing the value of the slope of the parent function to a negative value results in the graph of $y = x$ reflecting over the x-axis. You can think of it as the graph of $y = x$ flipped over the x-axis.

Example 3: Dilations

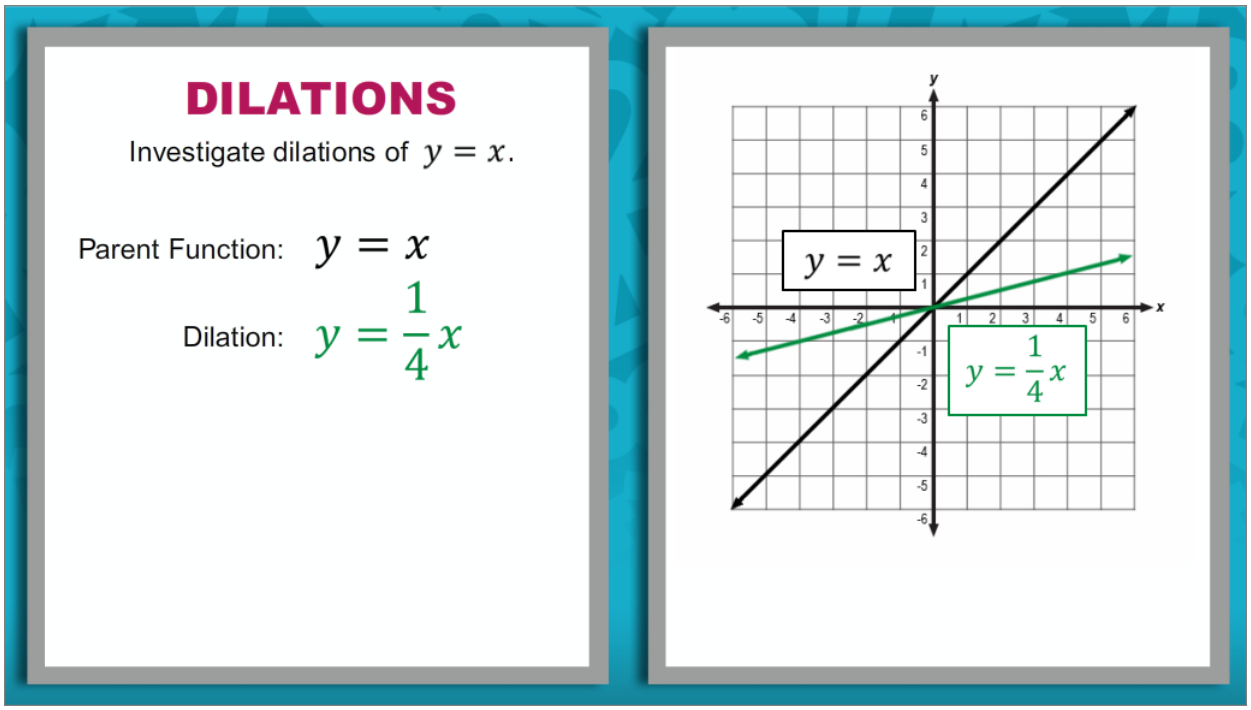


Investigate dilations of $y = x$.

A dilation can be described as a stretch or a compression.

Increasing the value of the slope of the parent function results in the graph of $y = x$ stretching away from the x-axis. The line becomes steeper as the value of the slope increases. In this example, the graph of the parent function was stretched by a factor of 4.

Example 3: Dilations (continued)

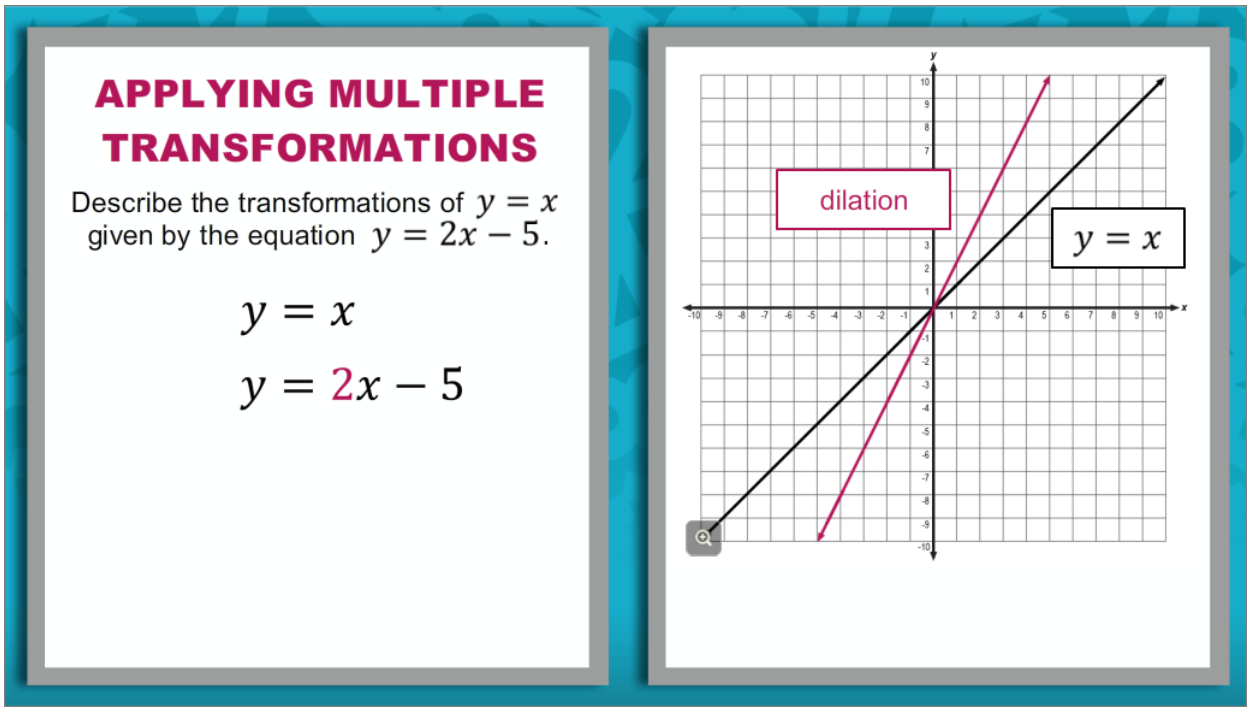


Investigate dilations of $y = x$.

Decreasing the slope of the parent function to a positive fractional value, or in other words a value greater than 0 but less than 1, results in a compression of the graph of $y = x$. The line becomes less steep as the slope decreases. It moves closer to the x-axis.

In this example, the graph of the parent function was compressed by a factor of $\frac{1}{4}$.

Example 4: Applying Multiple Transformations



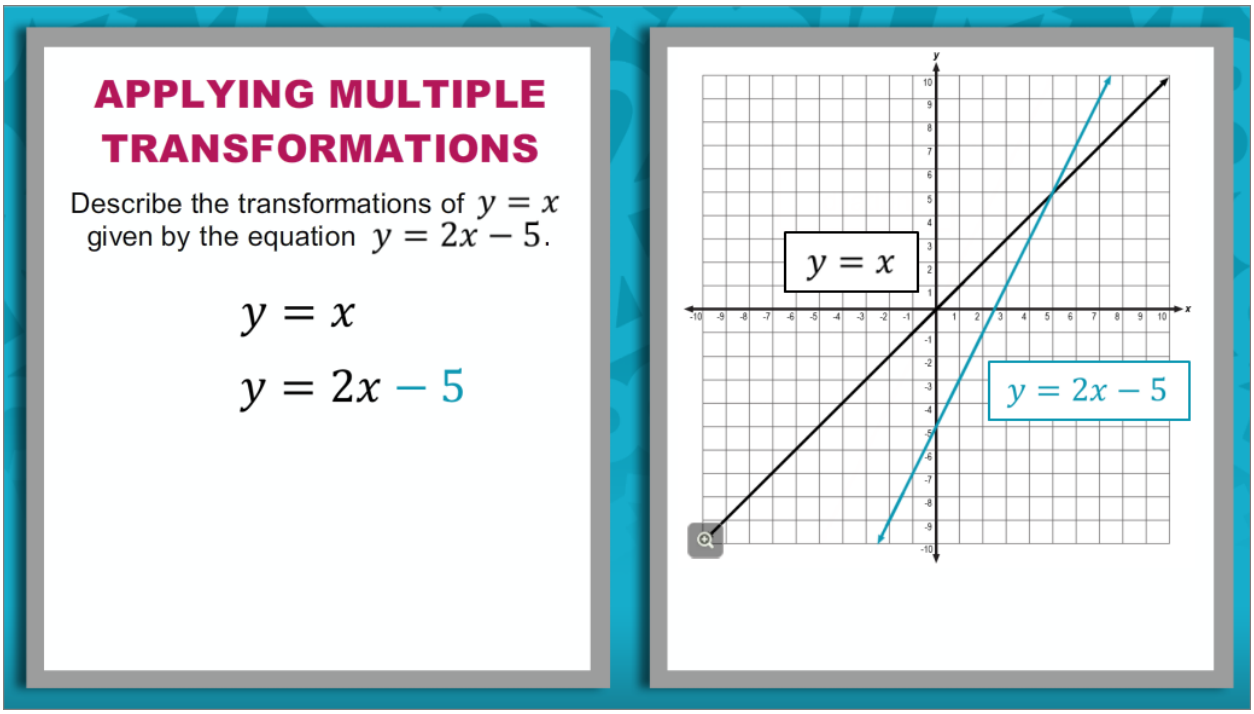
Describe the transformations of $y = x$ given by the equation $y = 2x - 5$.

It is possible to apply more than one transformation to the parent function.

Consider the linear equation $y = 2x - 5$. Notice that the slope of the given equation is 2. So you can conclude that a dilation has occurred.

Because 2 is a positive whole number, you can further conclude that the graph of the parent function was stretched by a factor of 2.

Example 4: Applying Multiple Transformations (continued)

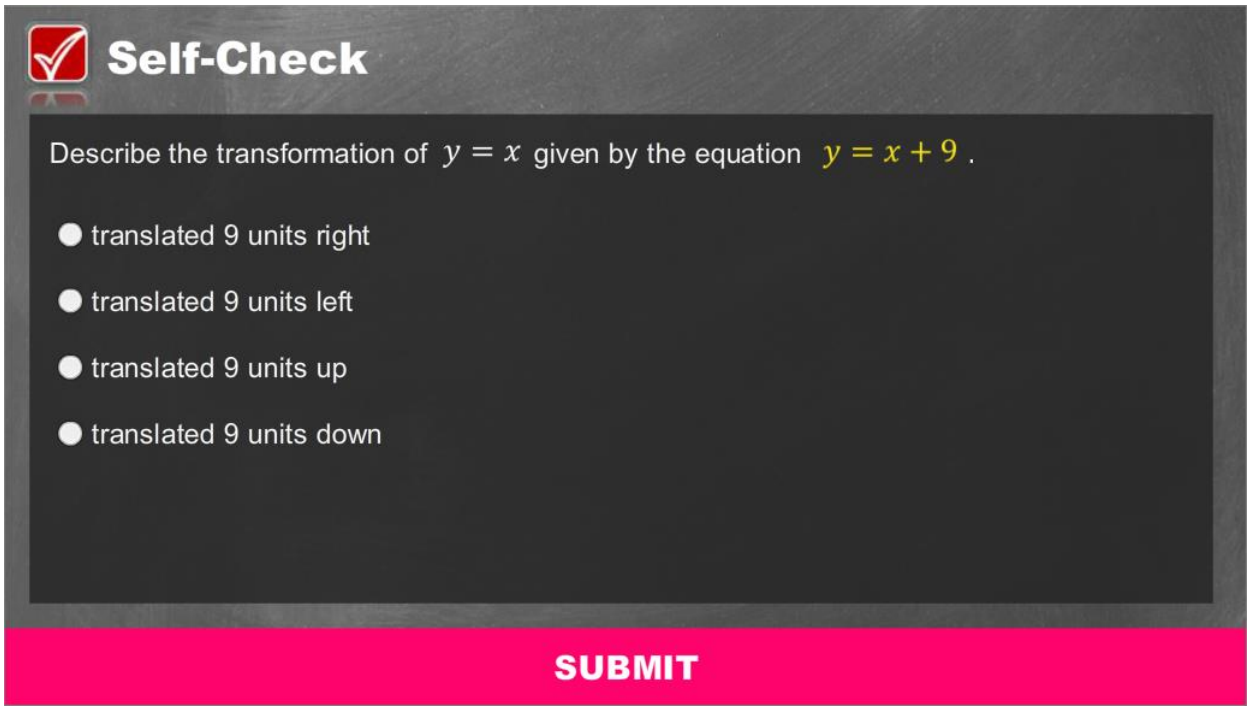


Describe the transformations of $y = x$ given by the equation $y = 2x - 5$.

As well as being stretched by a factor of 2, the value 5 was subtracted from the parent function. Therefore, the graph was translated 5 units down.

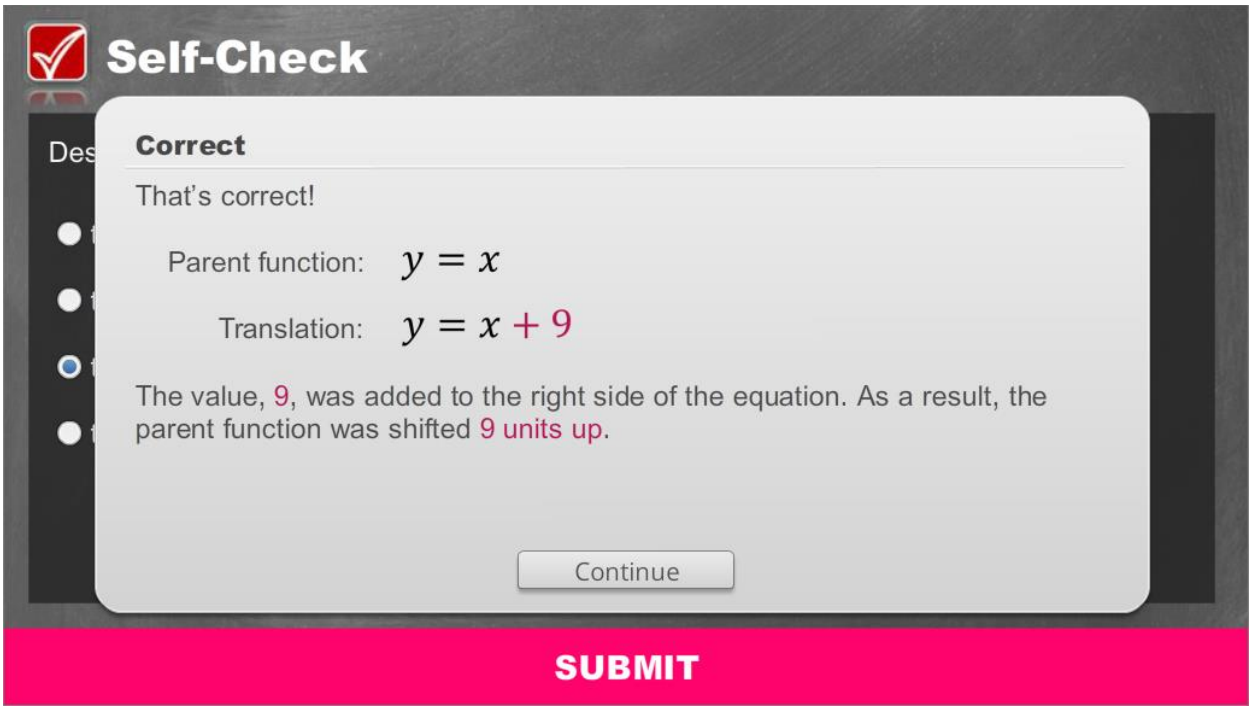
The graph of $y = 2x - 5$ stretches the parent function by a factor of 2 and translates the graph 5 units down.

Self-Check 1



Solve the problem in the image above to check your understanding of the content.

Self-Check 1: Answer



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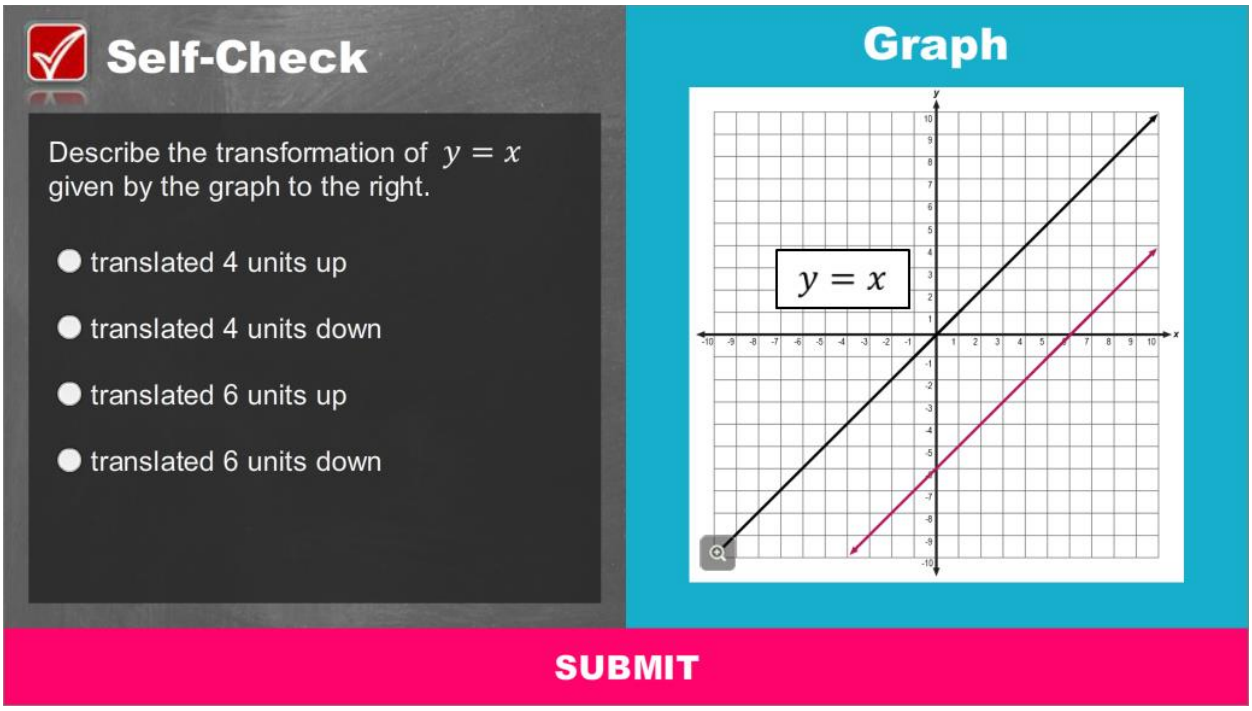
Self-Check 2



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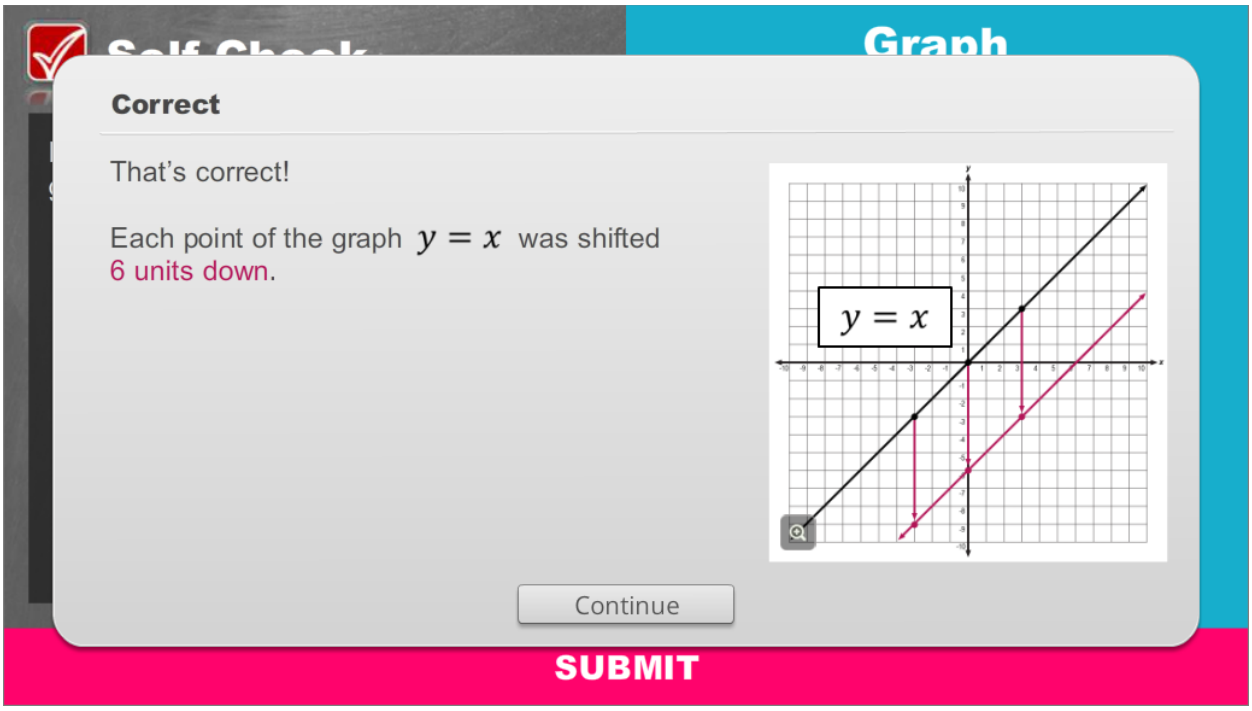
Self-Check 2: Answer



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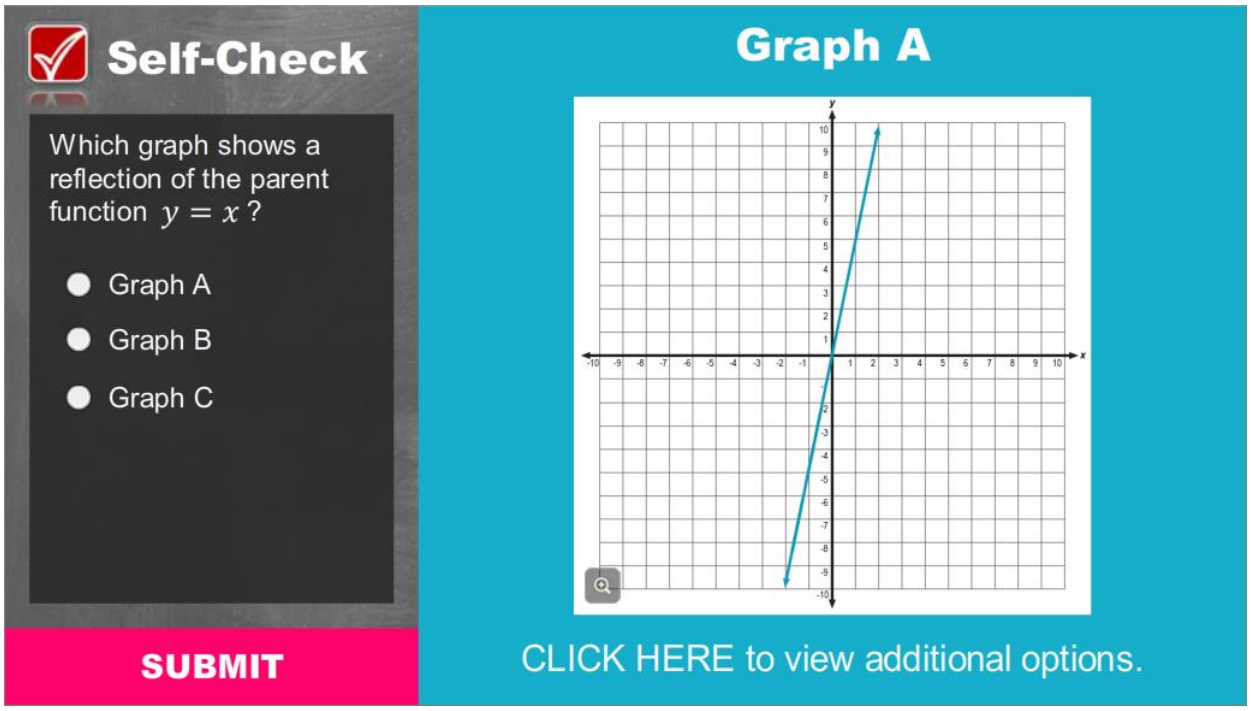
Self-Check 3



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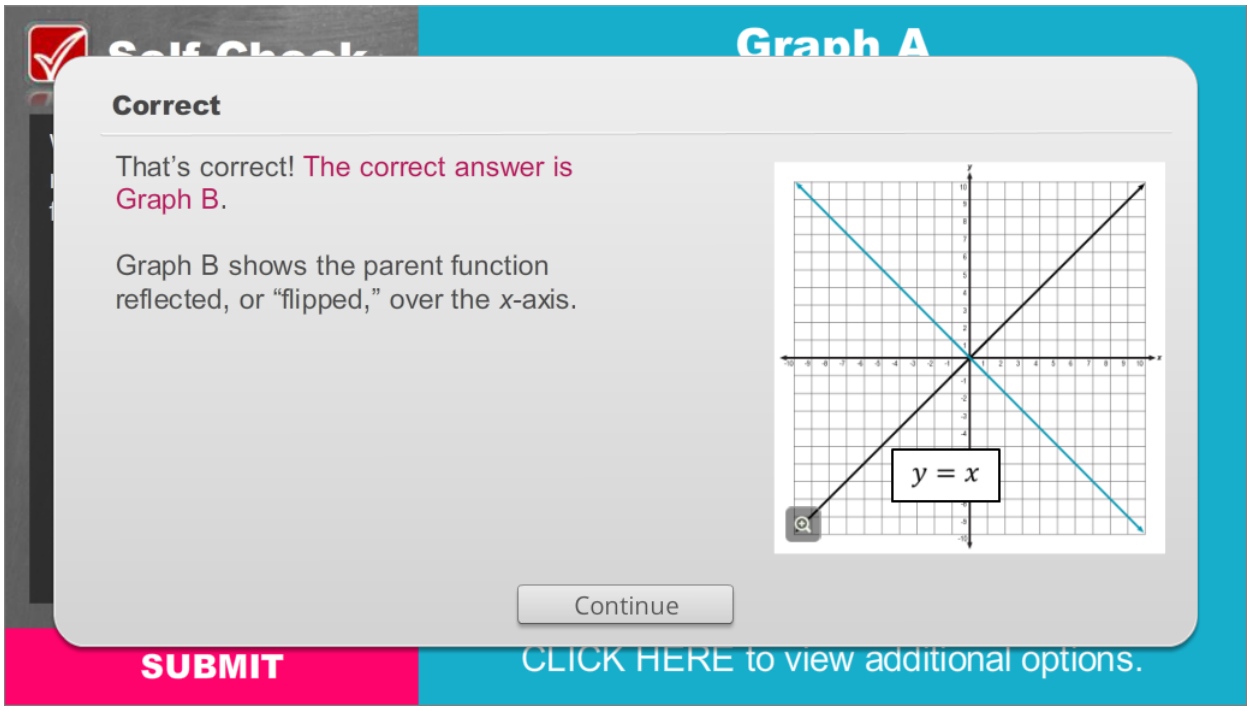
Self-Check 3: Answer



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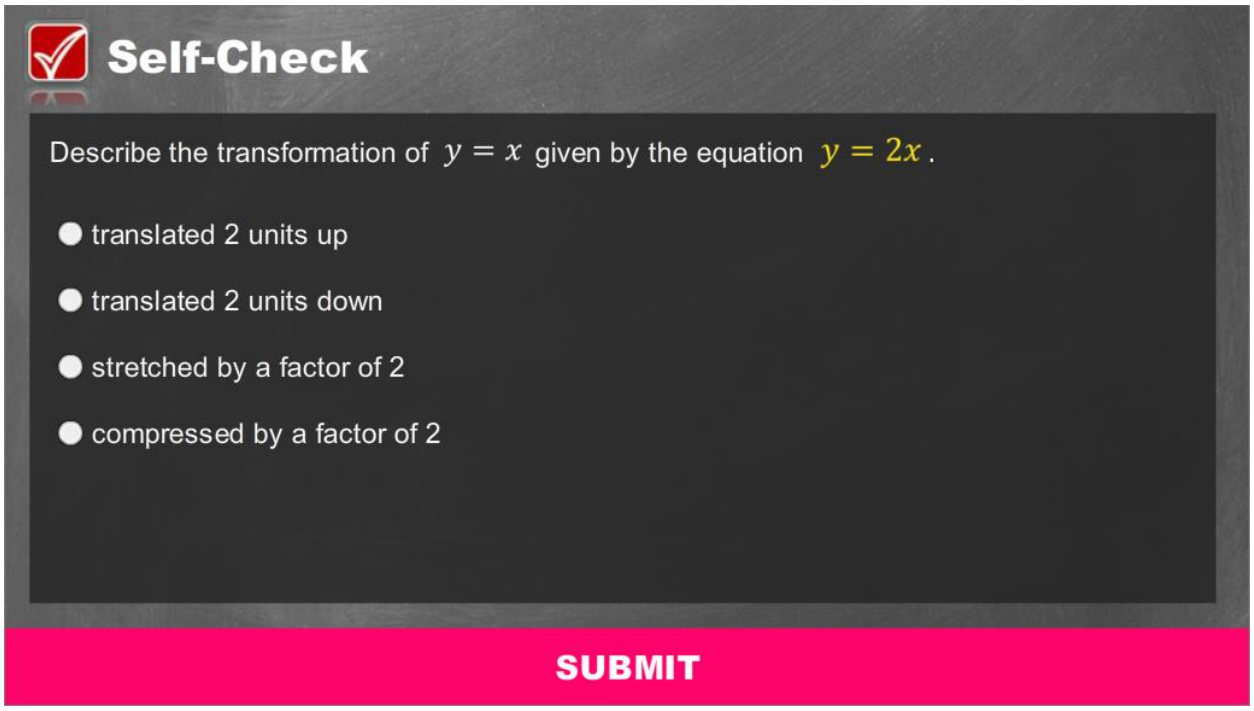
Self-Check 4



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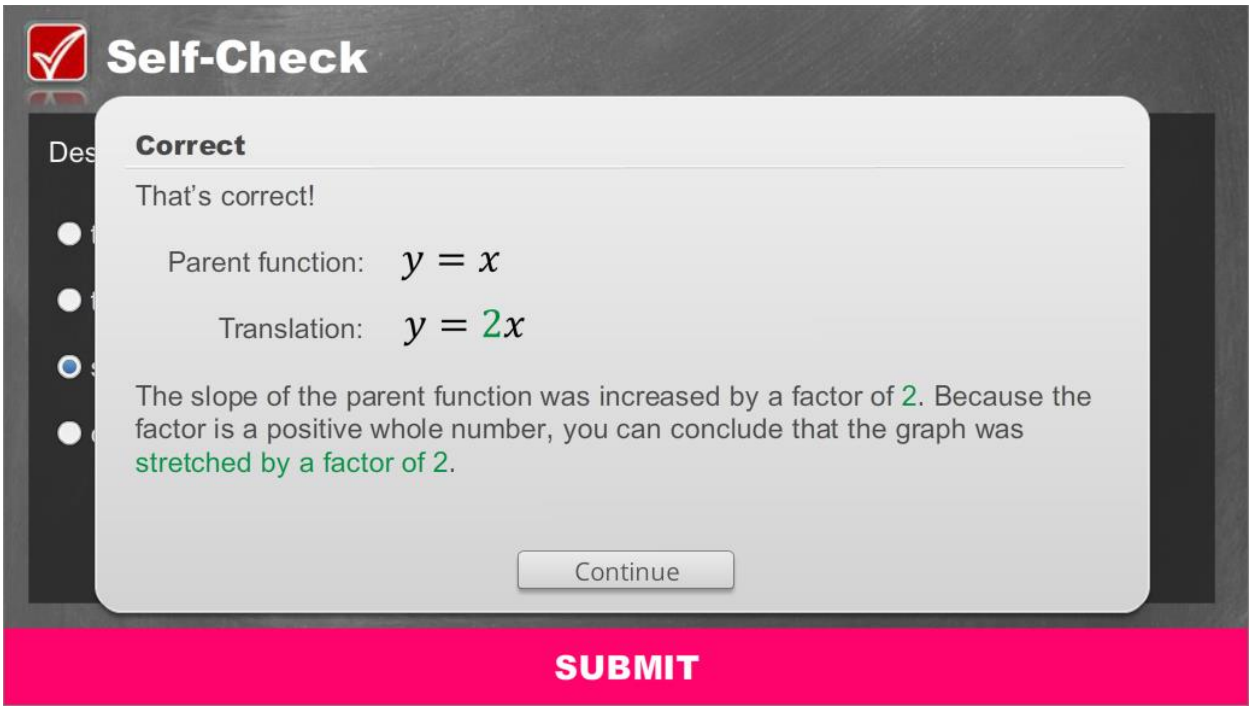
Self-Check 4: Answer



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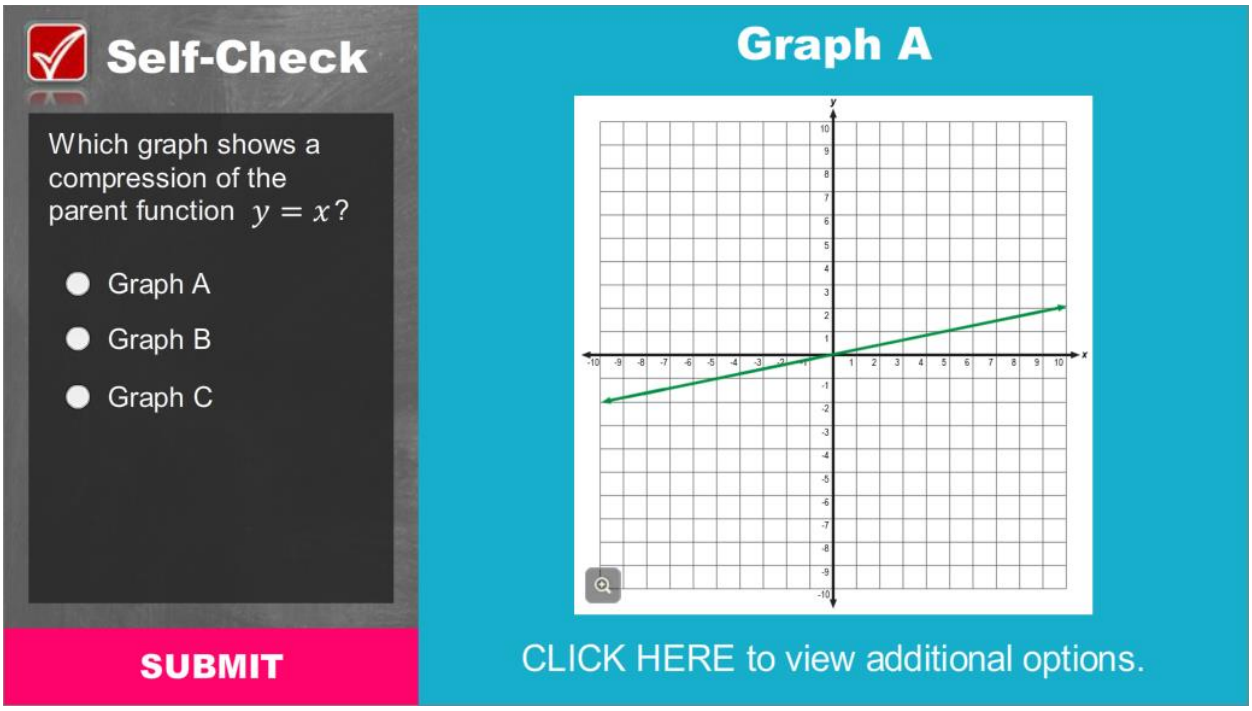
Self-Check 5



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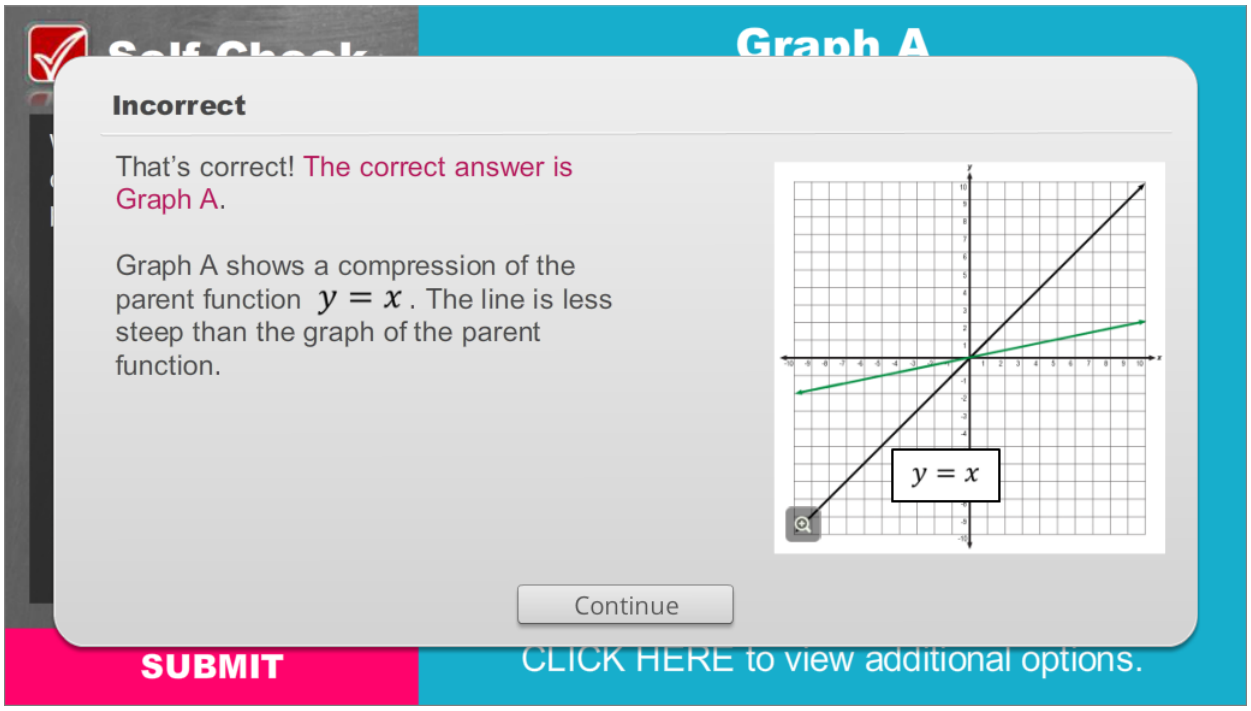
Self-Check 5: Answer



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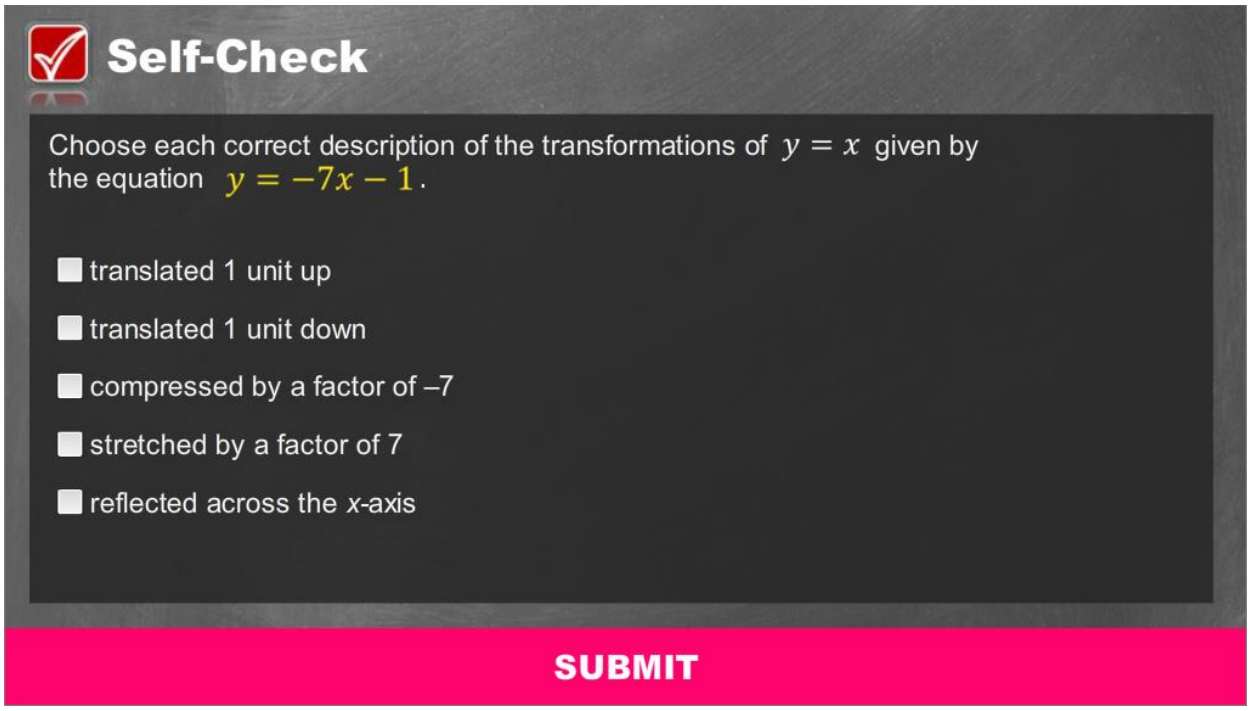
Self-Check 6



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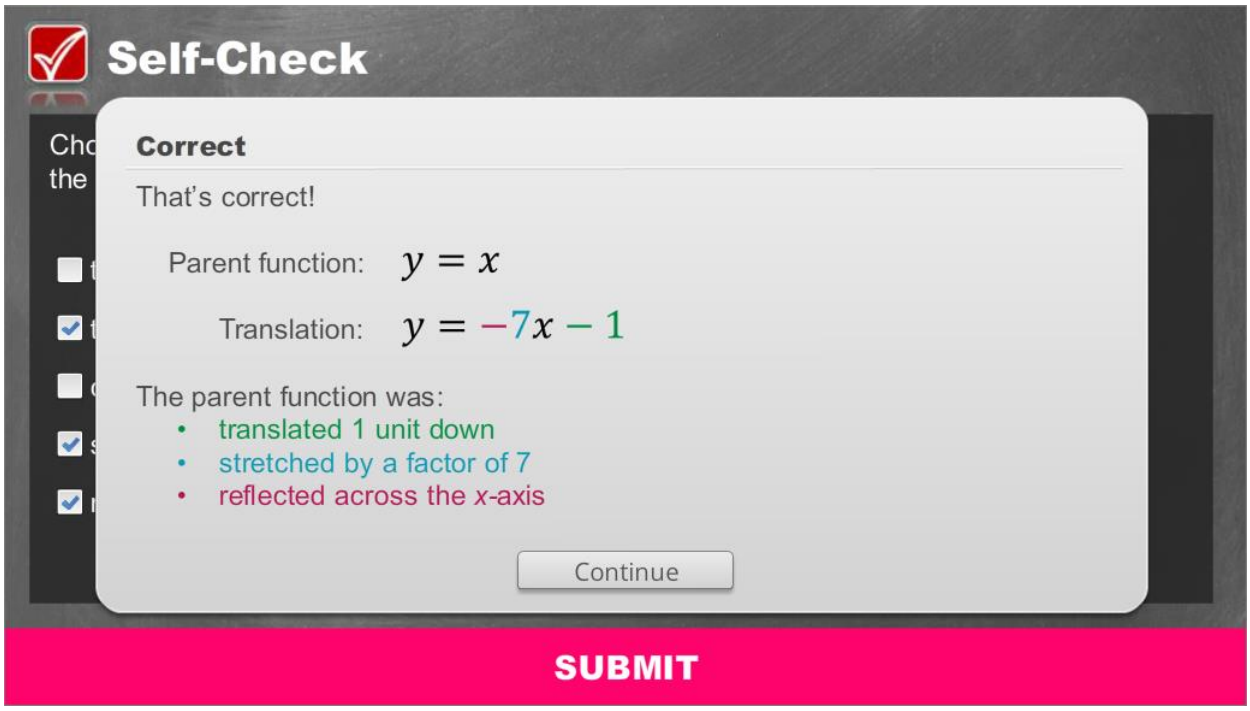
Self-Check 6: Answer



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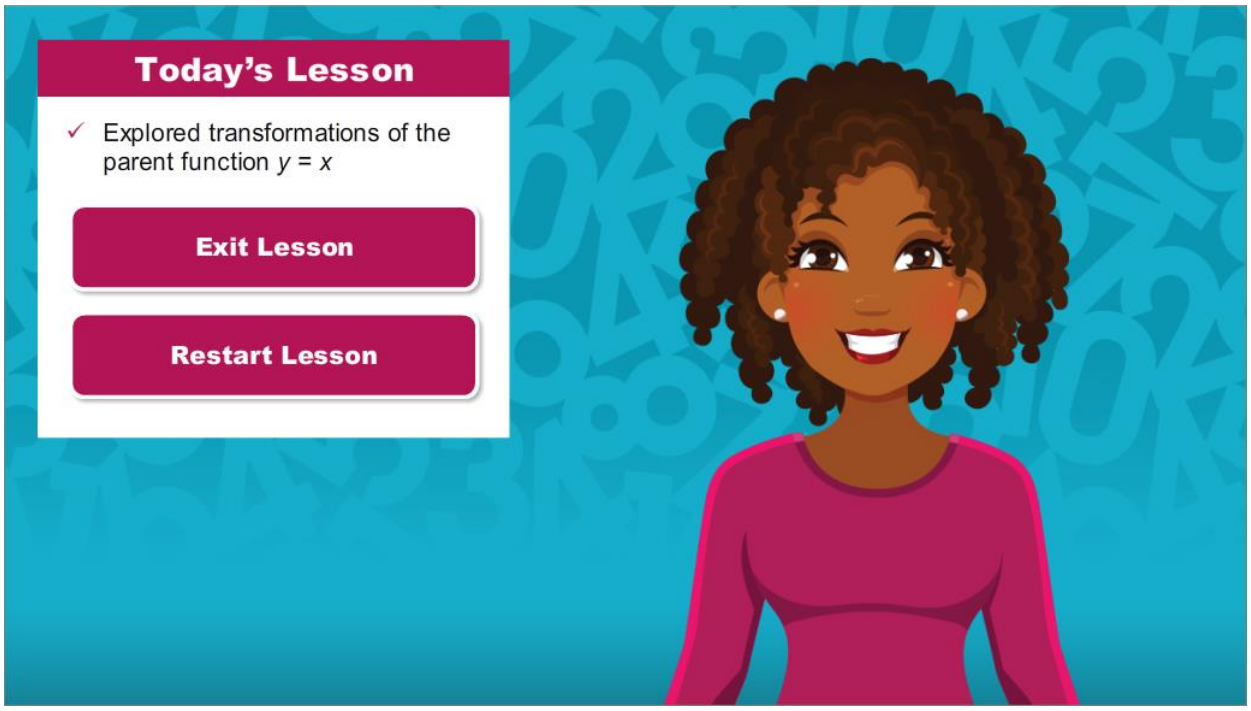
Conclusion



You have reached the conclusion of this lesson where you explored transformations of the parent function $y = x$.