

Section 1.6 - Transformations Using Multiplication

Transformations

Mathematical operations performed on functions to change the position or shape of the associated curves or lines (reflection, up, down, left, right, compression, stretch)

Learning Goal:

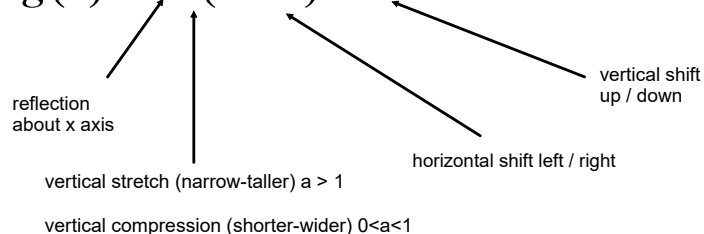
To understand how the parameters a , b , h , and k in a parent function affect its graph.

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Grade 10 Review - Transformations

$$f(x) = x^2 \quad (\text{base curve - original function})$$

$$g(x) = -a(x-h)^2 + k \quad (\text{transformed curve - new function})$$



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Using Graphing Technology investigate the following quadratics:

$$y = (x - 3)^2 \qquad y = (x)^2 + 4$$

$$y = -3(x)^2 \qquad y = 0.25(x)^2$$

$$y = 2(x + 5)^2 - 3$$

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The "a" value out front of the parent function controls the vertical stretch, vertical compression, and reflection about the x-axis.

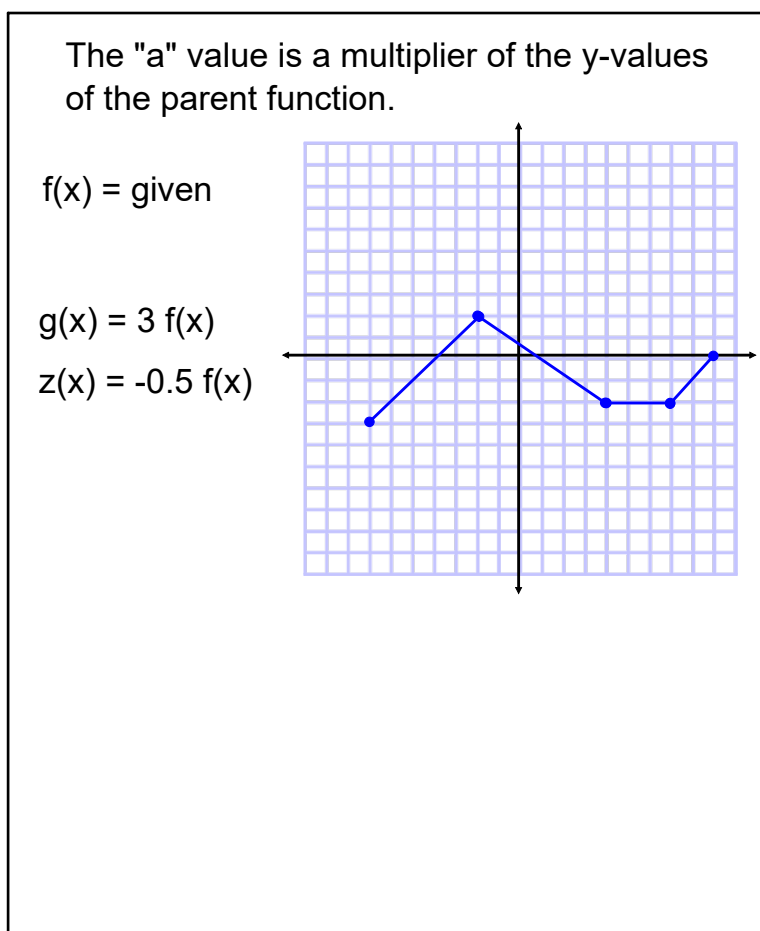
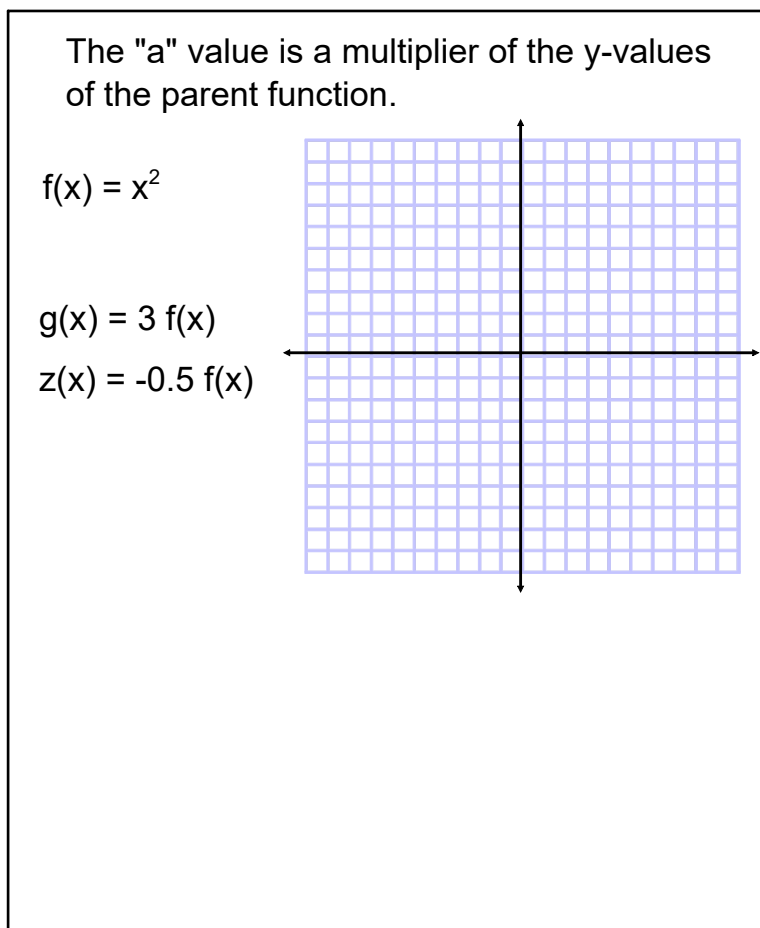
$$y = a f(x)$$

"a" is negative;
reflection
about x axis

vertical stretch $a > 1$

vertical compression $0 < a < 1$

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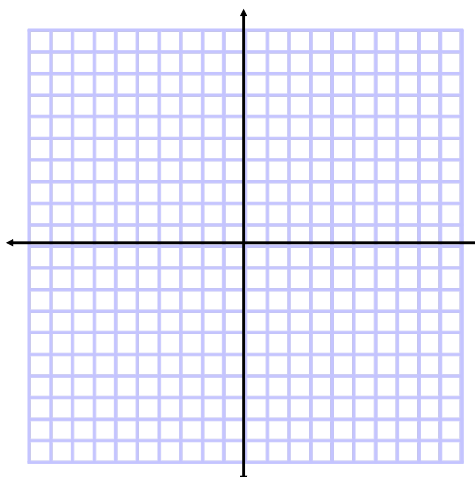


The "a" value is a multiplier of the y-values of the parent function.

$$f(x) = \frac{1}{x}$$

$$g(x) = 3 f(x)$$

$$z(x) = -0.5 f(x)$$



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The "b" value inside of the parent function controls the horizontal stretch, horizontal compression, and reflection about the y-axis.

$$y = f(bx)$$

"b" is negative;
reflection
about y axis

horizontal compression when $b > 1$

horizontal stretch $0 < b < 1$

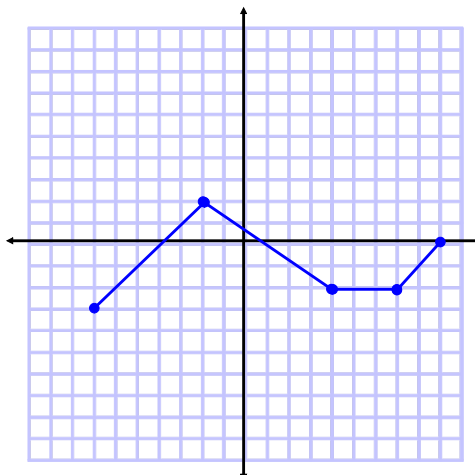
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The "b" value is a divider of the x-values of the parent function.

$$f(x) = \text{given}$$

$$g(x) = f(2x)$$

$$z(x) = f(-0.5x)$$



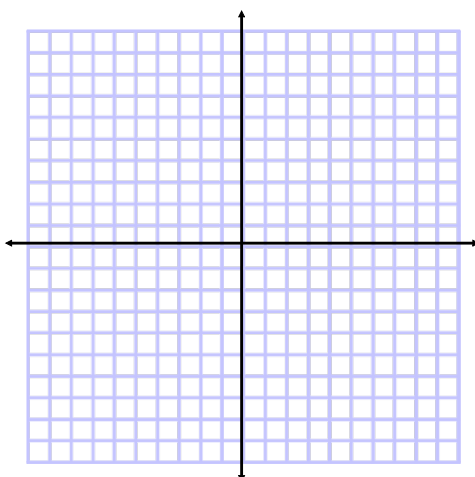
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The "b" value is a divider of the x-values of the parent function.

$$f(x) = \sqrt{x}$$

$$g(x) = f(2x)$$

$$z(x) = f(-0.5x)$$



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Summary

$$y = af(bx)$$

"a" is vertical stretch or compression
- MULTIPLY the y values of the
parent curve by "a" to create the
transformation

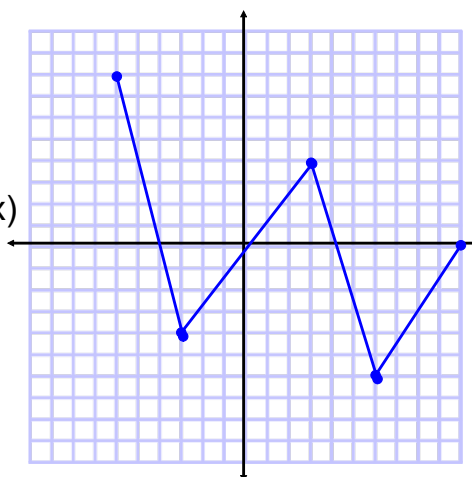
"b" is horizontal stretch or
compression - DIVIDE the x values
of the parent curve by "b" to create
the transformation

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Transform the following

$f(x) = \text{given}$

$g(x) = -0.25 f(3x)$



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Homework

Pg. 58-59 #1-4, 7, 8

Sep 10-11:01 PM