

# Families of Functions

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**Date created:** 09/08/2014 9:47 AM PST ; **Date modified:** 10/06/2014 8:34 AM PST

## LESSON OVERVIEW

<b>Subject(s)</b>	Mathematics
<b>Topic or Unit of Study</b>	Algebra II (Honors) - Families of Functions
<b>Grade/Level</b>	Grade 10
<b>Objective</b>	Students will be able to write the equation and graph a translation or reflection when given a parent function.
<b>Summary</b>	

## IMPLEMENTATION

<b>Learning Context</b>	Students have learned what an absolute function is and have taken geometry (so should have been introduced to the idea of translations and rotations).
<b>Teaching Strategies</b>	Direct instruction
<b>Time Allotment</b>	1 class periods. 50 Mins. per class.
<b>Sample Student Products</b>	
<b>Author's Comments &amp; Reflections</b>	

## PROCEDURE

<b>Anticipatory Set</b>	<p><u><a href="#">Introduction</a></u></p> <p>Due to genetics, we take some of our looks from our parents. Some more than others. Look at this slideshow to see examples of children spliced with one of their parents.</p> <p><a href="http://www.ryot.org/photos-look-like-our-parents-genetics/784081">http://www.ryot.org/photos-look-like-our-parents-genetics/784081</a></p>
<b>Modeling</b>	<p><b><u>Definitions</u></b></p> <p>A <b>parent function</b> is the simplest function with certain common characteristics.</p> <p>A <b>translation</b> shifts a graph horizontally, vertically, or both. It</p>

results in a graph of the same shape and size but possibly in a different position.

A vertical **stretch** multiplies all  $y$ -values by the same factor greater than 1, thereby stretching a graph vertically.

A vertical **shrink** reduces  $y$ -values by a factor between 0 and 1, thereby compressing the graph vertically.

A **reflection** across the  $x$ -axis changes  $y$ -values to their opposites. When you change the  $y$ -values of a graph to their opposites, the graph reflects across the  $x$ -axis.

Each member of a family of functions is a **transformation**, or change, of a parent function. Algebraically, the transformation take the same form using **parameters**, like  $h$ ,  $k$ , and  $a$ . Graphically, the results are similar-shifts, stretches, shrinks, and reflections of the parent function.

### Vertical Translation

Parent function	$y =  x $	$y = f(x)$
Translation up $k$ units, $k > 0$	$y =  x  + k$	$y = f(x) + k$
Translation down $k$ units, $k > 0$	$y =  x  - k$	$y = f(x) - k$

### Horizontal Translation

Parent function	$y =  x $	$y = f(x)$
Translation right $h$ units, $h > 0$	$y =  x - h $	$y = f(x - h)$
Translation left $h$ units, $h > 0$	$y =  x + h $	$y = f(x + h)$

### Combined Translation

(right $h$ units, up $k$ units)	$y =  x - h  + k$	$y = f(x - h) + k$
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#### Guided Practice

Create an example for each in the table and then one example to find the equation given the translation and another example of finding the translation given the equation.

#### Independent Practice

Students will be assigned homework which they may start in class. The homework is textbook pages 99-101, problems 1, 2, 5-9, 23, 26, 29-34 (Do not graph!), 42, 43.

#### Closure

Review the different types of translations (four directions) and the

identifying format (k or h).

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**Follow-Up**

The warm-up for the next day will be review the concepts of today's lesson.

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**MATERIALS AND RESOURCES**

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**Instructional Materials****Resources**

- Materials and resources:  
Algebra textbook, whiteboards, whiteboard marker and eraser
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**STANDARDS & ASSESSMENT**

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**Standards**

**Display:**  Collapse All  Expand All

▼ **CA- California Common Core State Standards (2012)**

▼ **Subject:** Mathematics

▼ **Grade:** Grade 8

▼ **Domain:** Geometry 8.G

▼ **Area:** Understand congruence and similarity using physical models, transparencies, or geometry software.

**Standard:**

1. Verify experimentally the properties of rotations, reflections, and translations: a. Lines are taken to lines, and line segments to line segments of the same length. b. Angles are taken to angles of the same measure. c. Parallel lines are taken to parallel lines.

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**Assessment Plan**

Homework is out of 20 points. The teacher will check 5 questions and grade *each* question (worth 4 points). The 5 questions will be from different sections of the assignment to avoid grading 5 questions that are the same problem-type (example: 5 problems asking to plot a linear equation) which may not adequately represent the student's progress towards the lesson's learning goal/standard.

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**Assessment/Rubrics****Rubrics:**

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| 1. <a href="#">Textbook Homework Rubric</a> |
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