Student Handout Name ___________________________

Combining Transformations

Problem 1—Combining Transformations a·f(b·(x - c)) + d

In the **Transforming Functions** activity you investigated the effects of **a**, **b**, **c**, and **d** on functions in the form **a**·f(x), f(**b**·x), and f(x- **c**) + **d** respectively. In each case you looked at one (or two) values in isolation from the others. In **Problems 1 & 2** you investigated **a**, in **Problems 3 & 4** you investigated the values **c** and **d**, and in **Problem 5** you investigated the value **b**.

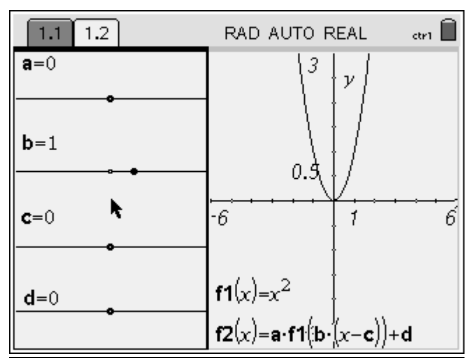
In this activity you will take what you have learned in the **Transforming Functions** activity and apply it to different families of functions while combining all of these values (or transformations) in the form **a**·f(**b**·(x - **c**)) + **d**.

Question

1. In general, how do each of the values **a**, **b**, **c**, and **d** affect the f(x)?

In page 1.2, sliders have been created to investigate the concept of combining transformations.

To transform **f1**(x), grab a point on one of the sliders and use the ◀ and ▶ arrows of the NavPad to move the point along the slider changing the value of **a**, **b**, **c**, or **d**. As you do this you should notice a dotted graph of the function **f2**(x) now displayed along with the parent function **f1**(x).



Note: If you are using a handheld, the dotted graph of **f2**(x) may appear slowly.

Use the table on pages 2-6 of this handout to explore **a**·f(**b**·(x - **c**)) + **d** for different values of **a**, **b**, **c**, and **d** and different parent functions f(x).

For each row in the table, give an example of a parent function that meets the criteria (e.g. f(x) = x^2 is an example of a parent function that meets the criteria of f(x) = x^{even}), sketch a graph of the example, and describe the domain and range of your example.

Note: You may check your work with page 1.2. To do this change **f1**(x) = x^2 to each of the parent functions in your examples.

$f(x) = x^{odd}$	$f(x) + c$	$f(x – c)$	$c·f(x)$	$f(c·x)$
f(x) = ________________ Domain Range	f(x) = ________________ Domain Range	f(x) = ________________ Domain Range	f(x) = ________________ Domain Range	f(x) = ________________ Domain Range

$f(x) = x^{even}$	$f(x) + c$	$f(x – c)$	$c·f(x)$	$f(c·x)$
f(x) = ________________ Domain Range	f(x) = ________________ Domain Range	f(x) = ________________ Domain Range	f(x) = ________________ Domain Range	f(x) = ________________ Domain Range

$f(x) = \frac{1}{x^{odd}}$	$f(x) + c$	$f(x - c)$	$c \cdot f(x)$	$f(c \cdot x)$
f(x) = ______________	f(x) = ______________	f(x) = ______________	f(x) = ______________	f(x) = ______________
Domain Range	Domain Range	Domain Range	Domain Range	Domain Range

$f(x) = \frac{1}{x^{even}}$	$f(x) + c$	$f(x - c)$	$c \cdot f(x)$	$f(c \cdot x)$
f(x) = ______________	f(x) = ______________	f(x) = ______________	f(x) = ______________	f(x) = ______________
Domain Range	Domain Range	Domain Range	Domain Range	Domain Range

$f(x) = \sqrt[odd]{x}$	$f(x) + c$	$f(x - c)$	$c \cdot f(x)$	$f(c \cdot x)$
f(x) = ________________	f(x) = ________________	f(x) = ________________	f(x) = ________________	f(x) = ________________
Domain Range	Domain Range	Domain Range	Domain Range	Domain Range
$f(x) = \sqrt[even]{x}$	$f(x) + c$	$f(x - c)$	$c \cdot f(x)$	$f(c \cdot x)$
f(x) = ________________	f(x) = ________________	f(x) = ________________	f(x) = ________________	f(x) = ________________
Domain Range	Domain Range	Domain Range	Domain Range	Domain Range

f(x) = |x|	**f(x) + c**	**f(x – c)**	**c·f(x)**	**f(c·x)**
f(x) = ________________	f(x) = ________________	f(x) = ________________	f(x) = ________________	f(x) = ________________
<u>Domain</u> <u>Range</u>	<u>Domain</u> <u>Range</u>	<u>Domain</u> <u>Range</u>	<u>Domain</u> <u>Range</u>	<u>Domain</u> <u>Range</u>

f(x) = [x]	**f(x) + c**	**f(x – c)**	**c·f(x)**	**f(c·x)**
f(x) = ________________	f(x) = ________________	f(x) = ________________	f(x) = ________________	f(x) = ________________
<u>Domain</u> <u>Range</u>	<u>Domain</u> <u>Range</u>	<u>Domain</u> <u>Range</u>	<u>Domain</u> <u>Range</u>	<u>Domain</u> <u>Range</u>

f(x) = sin x	f(x) + c	f(x – c)	c·f(x)	f(c·x)
f(x) = ________________	f(x) = ________________	f(x) = ________________	f(x) = ________________	f(x) = ________________
Domain Range	Domain Range	Domain Range	Domain Range	Domain Range

f(x) = cos x	f(x) + c	f(x – c)	c·f(x)	f(c·x)
f(x) = ________________	f(x) = ________________	f(x) = ________________	f(x) = ________________	f(x) = ________________
Domain Range	Domain Range	Domain Range	Domain Range	Domain Range

Check for Understanding

1. Given the function f(x). Identify the parent function of f(x), describe the transformations applied to the parent function, and without using the handheld sketch a graph of f(x) on the grid provided. Then use page 1.1 to check your work.

a. $f(x) = -2\cdot(x - 2)^4 - 3$

b. $f(x) = \frac{1}{2}|x| - 4$

c. $f(x) = 3\sqrt{x+2}$

d. $f(x) = \frac{4}{x-2}$

e. $f(x) = 3\cos(x+\pi)$

f. $f(x) = -[x+3]-5$

g. $f(x) = -2\sin(x-\frac{\pi}{4})-4$

h. $f(x) = \frac{2}{(x+6)^3}-4$

i. $f(x) = \sqrt[3]{3x-6}$

WARNING: At the end of the activity, do not save the changes. Close the document and answer NO to saving changes. You may want to be able to open up the file again without all the data that you gathered and graphed.