CCSS Advanced Algebra 3 More Quadratic Transformations:

1. Let $f(x) = (x+7)(x-5)$.
   a. What are the x-intercepts of the function? y-intercept? a) y: -35 x: $x=-7, x=5$
   b. Consider the transformation $g(x) = f(x-2)$. What are the x-intercepts of $g(x)$? b) $x=-5, x=7$ Shifted 2 right
   c. Consider the transformation $h(x) = 3f(x) - 1$. What is the y-intercept of $h(x)$? c) $y = 3 \cdot -35 - 1 = -105 - 1 = -106$

2. For the function $w(x) = x^2 + 6x + 8$,
   d. Find the x-intercepts and the y-intercept. y-int $=8$, x-int: $(x+4)(x+2)$, $x=-4, x=-2$.
   e. What transformation would be applied to $w(x)$ that would result in the new function $v(x) = (x+5)(x+7)$? Shift Left 1. $v(x) = w(x+1)$
   f. Explain why the transformed function $u(x) = 5w(x)$ has the same x-intercepts as $w(x)$.
   Because if $w(x)=0$, then $5 \cdot w(x) = 0$. So if $x=-4$ makes $w(-4)=0$, then $5w(-4) = 5 \cdot 0$.

3. Write $f(x) = (x+7)(x-5)$
   a. in standard form, $f(x) = ax^2 + bx + c$. $= x^2 + 2x - 35$
   b. Complete the square (see below for notes) to write $f(x)$ in Graphing Form $f(x) = a(x-h)^2 + k$ and write the vertex of the parabola. $-36 = (x+1)^2 - 36$ vertex $= (-1, -36)$
   c. What is the vertex of $g(x) = f(x-2)$?
   d. What is the vertex of $h(x) = 3f(x) - 1$?
   c) $f(x-2)$ means Move right 2, so vertex $= (1, -36)$.
   d) $3f(x) - 1$ means 3 times taller & down 1 so vertex $= (-1, -109)$

4. Completing the square practice (see below for notes). Write each quadratic function in Graphing Form and determine the vertex (BOTH x AND y):
   a. $p(x) = x^2 + 10x - 24 = (x+5)^2 - 49$
   b. $q(x) = x^2 - 5x + 6 = (x-2.5)^2 - .25$
   c. $r(x) = 2x^2 + 6x - 36 = 2(x+1.5)^2 - 40.5$
   d. $s(x) = 5x^2 - 20x + 25 = 5(x-2)^2 + 5$
   e. $t(x) = 10x^2 - 18x - 36 = 10(x-.9)^2 - 42.1$

5. For each quadratic equation above, describe the transformations that would be required to go from the parent graph ($y = x^2$) to the new function. Be specific using the terms horizontal/vertical translation, reflection, dilation.

a) Left 5, down 49

b) Right 2.5, down .25

c) Left 1.5, down 40.5, Vertical stretch of 2

d) Right 2, vertical stretch of 5, up 5.

e) Right .9, vertical stretch of 10, down 42.1

Completing the Square Notes (Converting a Quadratic Function from Standard to Graphing Form):

Example: $f(x) = x^2 + 20x + 36$

Step 1: Create a generic rectangle and put the x^2 in the lower left corner.

$f(x) = x^2 + 20x + 36$

x^2	

Step 2: Split the $20x$ in half and place each half in the generic rectangle.

**Why does it make sense to do this?

$10x$	
x^2	$10x$

Step 3: Fill out the outside (base and height) of the generic rectangle.

	$10x$	
x	x^2	$10x$
	x	10

Step 4: Complete the inside of the generic rectangle using the outside values.

	$10x$	100
x	x^2	$10x$
	x	10

Step 5: Determine what value must be added to the generic rectangle to match the original function.

$f(x) = x^2 + 20x + 36$

	$10x$	100
x	x^2	$10x$
	x	10

$+ \boxed{k}$

$100 + k = 36$

$-100 \quad -100$

$k = -64$

Step 5: Write the function in Graphing Form.

$f(x) = (x + 10)^2 - 64$