

1. Let $f(x) = (x+7)(x-5)$.

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

$y = 3 \cdot -35 - 1 = -105 - 1 = -106$ Shifted 2 right

2. For the function $w(x) = x^2 + 6x + 8$,

- d. Find the x-intercepts and the y-intercept. $y\text{-int} = 8, x\text{-int: } x = -4, x = -2$
 e. What transformation would be applied to $w(x)$ that would result in the new function $v(x) = (x+5)(x+7)$? $\text{Shift Left } 1, v(x) = w(x+1)$
 f. Explain why the transformed function $u(x) = 5w(x)$ has the same x-intercepts as $w(x)$.

~~Because~~ 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.
 c. What is the vertex of $g(x) = f(x-2)$?
 d. What is the vertex of $h(x) = 3f(x) - 1$?

$x^2 + 2x - 35 = (x+1)^2 - 36$
 vertex = $(-1, -36)$

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. $q(x) = x^2 - 5x + 6 = (x-2.5)^2 - 2.25$
 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.

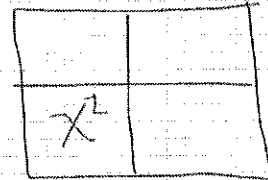
- a) left 5, down 49
 b) Right 2.5, down 2.25
 c) left 1.5, down 40.5, vertical stretch of 2
 d) Right 2, vertical stretch of 5, up 5.
 e) Right .9, vertical stretch of 10, down 42.1

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

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

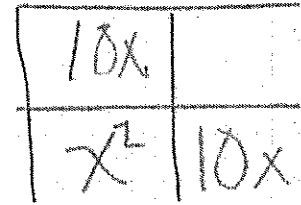
Step 1: Create a generic rectangle and put the x^2 in the lower left corner.

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

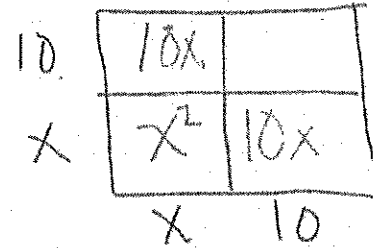


Step 2: Split the $20x$ in half and place each half in the generic rectangle.

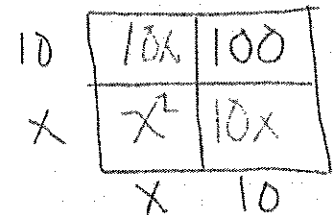
**Why does it make sense to do this?



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

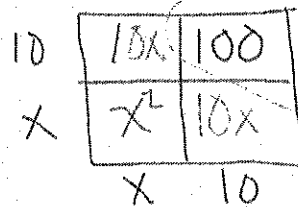


Step 4: Complete the inside of the generic rectangle using the outside values.



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

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



$$100 + k = 36$$

$$-100 \quad -100$$

$$k = -64$$

Step 5: Write the function in Graphing Form.

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