How to go from Factored to Vertex form

Example. *We first cover a few examples of quadratics in factored form.* ***(IN class)***

We are trying to convert from factored form to vertex form,

$$f(x) = b(mx \pm t)(nx \pm s) \longrightarrow f(x) = a(x-h)^2 + k.$$

Step 1. Set both factors equal to 0, and solve,

$$factor_1 = 0$$
$$factor_2 = 0.$$

After you have your x-intercepts, label them x_1 and x_2. (The order of assignment doesn't matter)

Step 2. Calculate h by,

$$h = \frac{x_1 + x_2}{2}.$$

Step 3. Calculate k by,

$$k = f(h).$$

Step 4. Calculate a by,

$$a = b \cdot m \cdot n.$$

Step 5. Write down the equation in vertex form,

$$f(x) = a(x-h)^2 + k.$$

Practice Problems:

Question 1. Convert the following quadratics to vertex form.

(a) $g(x) = -4(x-4)(x-6)$

(b) $A(x) = -x(4x+16)$

(c) $f(x) = (7-x)(3-x)$

(d) $\kappa(x) = (-2x+14)(x-5)$

(e) $\mu(x) = -(x+8)(8x+24)$

(f) $T(x) = (3x+6)(-2x-8)$

(g) $\eta(x) = (6x-12)^2$

Question 2. A quadratic function has x-intercepts $x_1 = 5, x_2 = -1$. It also has the point $(1, 8)$. Determine the equation of the quadratic function in vertex form, and also provide a sketch of the function. **Label:** The y-intercept, the vertex, and the x-intercepts.

$$f(x) = a(x-h)^2 + k.$$

Solutions to Practice Problems:

Question 1. Solution:

(a) $g(x) = -4(x-5)^2 + 4$

(b) $A(x) = -4(x+2)^2 + 16$

(c) $f(x) = -(x-5)^2 + 4$

(d) $\kappa(x) = -2(x-6)^2 + 2$

(e) $\mu(x) = -8\left(x + \frac{11}{2}\right)^2 + 50$

(f) $T(x) = -6(x+3)^2 + 6$

(g) $\eta(x) = 36(x-2)^2$

Question 2. Solution:

$$f(x) = -(x-2)^2 + 9.$$