Name: key Date: _____

Converting from Vertex Form to Standard Form

$$y = a(x-h)^2 + k \longrightarrow y = ax^2 + bx + c$$

Multiply out the binomial, distribute (if needed), & combine like terms.

1. $f(x) = (x-1)^2 + 8$

$f(x) = (x-1)(x-1) + 8$

$F(x) = x^2 - 1x - 1x + 1 + 8$

$F(x) = x^2 - 2x + 9$

2. $f(x) = 2(x+3)^2 - 5$

$F(x) = 2(x+3)(x+3) - 5$

$F(x) = 2(x^2 + 3x + 3x + 9) - 5$

$F(x) = 2x^2 + 6x + 6x + 18 - 5$

$F(x) = 2x^2 + 12x + 13$

3. $f(x) = -(x-4)^2 + 3$

$f(x) = -(x-4)(x-4) + 3$

$F(x) = -(x^2 - 4x - 4x + 16) + 3$

$F(x) = -x^2 + 4x + 4x - 16 + 3$

$F(x) = -x^2 + 8x - 13$

4. $f(x) = 2(x+1)^2 - 2$

$F(x) = 2(x+1)(x+1) - 2$

$F(x) = 2(x^2 + 1x + 1x + 1) - 2$

$F(x) = 2x^2 + 2x + 2x + 2 - 2$

$F(x) = 2x^2 + 4x$

Converting from Standard Form to Vertex Form

$$y = ax^2 + bx + c \longrightarrow y = a(x-h)^2 + k$$

Find the Vertex *Method:*

- ★ Identify a, b, & c.
- ★ Find the line of symmetry or "*h*" by using $h = \frac{-b}{2a}$
- ★ Find the y value of the vertex, or "*k*" by substituting "h" into the equation as "x".
- ★ Go get "a" (it stays the same).
- ★ Write the equation in vertex form using your found values of *a*, *h*, and *k*.

5. $f(x) = x^2 + 8x + 1$ $a=1, b=8, c=1$

$h = \frac{-b}{2a} = \frac{-8}{2(1)} = \frac{-8}{2} = -4$

$k = f(-4) = (-4)^2 + 8(-4) + 1 = -15$

$a = 1$

$f(x) = (x+4)^2 - 15$

6. $f(x) = x^2 + 10x + 20$ $a=1, b=10, c=20$

$h = \frac{-b}{2a} = \frac{-10}{2(1)} = \frac{-10}{2} = -5$

$k = F(-5) = (-5)^2 + 10(-5) + 20 = -5$

$a = 1$

$F(x) = (x+5)^2 - 5$

7. $f(x) = 3x^2 - 6x + 5$ $a=3, b=-6, c=5$

$h = \frac{-b}{2a} = \frac{-(-6)}{2(3)} = \frac{6}{6} = 1$

$k = f(1) = 3(1)^2 - 6(1) + 5 = 2$

$a = 3$

$f(x) = 3(x-1)^2 + 2$

8. $f(x) = -2x^2 - 16x - 32$ $a=-2, b=-16$ $c=-32$

$h = \frac{-b}{2a} = \frac{-(-16)}{2(-2)} = \frac{16}{-4} = -4$

$k = f(-4) = -2(-4)^2 - 16(-4) - 32 = 0$

$a = -2$

$f(x) = -2(x+4)^2 - 0$

Using the Ti-36 Calculator:

- ★ 2nd "Poly-Solv"
- ★ Type in a, b, and c
- ★ Hit ENTER on SOLVE
- ★ Scroll down until a, h, and k appear on the screen.

9. $f(x) = x^2 + 6x + 8$

$a = 1$

$h = -3$

$k = -1$

$f(x) = (x+3)^2 - 1$

10. $f(x) = x^2 - 4x + 3$

$a = 1$

$h = 2$

$k = -1$

$f(x) = (x-2)^2 - 1$

11. $f(x) = 3x^2 + 24x + 50$

$a = 3$

$h = -4$

$k = 2$

$f(x) = 3(x+4)^2 + 2$

12. $f(x) = -x^2 - 2x + 3$

$a = -1$

$h = -1$

$k = 4$

$f(x) = -(x+1)^2 + 4$