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

Converting from Standard Form to Vertex Form.

$y=2x^2-4x+9$ to $y=2(x-1)^2+7$ (opp, same)

$a=2$ $b=-4$ (1, 7)

1. **Special Part of the Quadratic Formula:** $\frac{-b}{2a}$.

   (This gives you the x-coordinate for your vertex!)

$$y=2x^2-4x+9$$

$$\frac{-b}{2a}=\frac{-(-4)}{2(2)}=\frac{4}{4}=1$$ ← X-Coordinate!!

2. **Plug in x to get y!**

$$y=2x^2-4x+9$$

$$y=2(1)^2-4(1)+9=7$$ ← Y-Coordinate!!

3. **Steal the "a" Value!** a= 2 in standard form so it equals 2 in vertex form.

$$y=2(x-1)^2+7$$

a x y

(The x-coordinate is always the opposite value!)

Now try these $y=a(x-h)^2+k$

a. $y=2x^2-8x+7$

$a=2$ $b=-8$

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

② $y=2(2)^2-8(2)+7$

$y=-1$ K

③ $y=2(x-2)^2-1$

b. $y=x^2-6x+8$

$a=1$ $b=-6$

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

② $y=(3)^2-6(3)+8$

$y=-1$ K

③ $y=1(x-3)^2-1$

c. $y=-2x^2+12x+1$

$a=-2$ $b=12$

① $\frac{-b}{2a}=\frac{-12}{2(-2)}=\frac{12}{4}=3$ h

② $y=-2(3)^2+12(3)+1$

$y=19$ K

③ $y=-2(x-3)^2+19$

GSE Algebra Name_____

Convert between vertex and standard forms of quadratic equations.

Convert from standard form to ***vertex*** form:

Remember: $y = a(x-h)^2 + k$

Let x = h and y = k

(x) $h = \frac{-b}{2a}$ to find k, plug the (x) h back into the equation and solve for (y) k.

1. $y = x^2 + 4x - 1$

$a = 1 \quad b = 4$

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

② $y = (-2)^2 + 4(-2) - 1$

$y = \boxed{-5}$ k

③ $y = 1(x - -2)^2 + -5$

$\boxed{y = (x+2)^2 - 5}$

2. $y = x^2 - 10x + 10$

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

② $y = (5)^2 - 10(5) + 10$

$y = \boxed{-15}$ k

③ $\boxed{y = (x-5)^2 - 15}$

3. $y = 2x^2 + 10x + 17$

① $\frac{-b}{2a} = \frac{-10}{2(2)} = \frac{-10}{4} = \boxed{-2.5}$ h

② $y = 2(-2.5)^2 + 10(-2.5) + 17$

$y = \boxed{4.5}$ k

③ $\boxed{y = 2(x+2.5)^2 + 4.5}$

4. $y = -2x^2 + 6x - 3$

① $\frac{-b}{2a} = \frac{-6}{2(-2)} = \frac{-6}{-4} = \boxed{1.5}$ h

② $y = -2(1.5)^2 + 6(1.5) - 3$

$y = \boxed{1.5}$ k

③ $\boxed{y = -2(x-1.5)^2 + 1.5}$

5. $y = x^2 + 12x + 6$

① $\frac{-b}{2a} = \frac{-12}{2(1)} = -6$

② $y = (-6)^2 + 12(-6) + 6$

$y = -30$

③ $\boxed{y = (x+6)^2 - 30}$

6. $y = 3x^2 - 9x + 18$

① $\frac{-b}{2a} = \frac{-(-9)}{2(3)} = \frac{9}{6} = 1.5$

② $y = 3(1.5)^2 - 9(1.5) + 18$

$y = 11.25$

③ $\boxed{y = 3(x-1.5)^2 + 11.25}$

7. $y = x^2 + 8x + 4$

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

② $y = (-4)^2 + 8(-4) + 4$

$y = -12$

③ $y = (x-(-4))^2 - 12$

$\boxed{y = (x+4)^2 - 12}$

8. $y = 6x^2 - 12x - 18$

① $-\frac{b}{2a} = \frac{-(-12)}{2(6)} = \frac{12}{12} = 1$

② $y = 6(1)^2 - 12(1) - 18$

$y = -24$

③ $\boxed{y = 6(x-1)^2 - 24}$