Changing Forms Notes – Standard to Vertex

To change from Standard Form to Vertex Form by finding the vertex: START: $y = ax^2 + bx + c$ END: $y = a(x-h)^2 + k$

- **Find the Vertex of the function**
  - **Use $\frac{-b}{2a}$ to find the "h" or x – value of the vertex** → $\left(\frac{-b}{2a}, \text{plug in x-value}\right)$
  - **Substitute that x – value back into the equation to find the "k" or the y – value of the vertex**
- **Find the "a" from the standard form equation**
- **Plug the "h", "k", and "a" into Vertex Form** $y = a(x-h)^2 + k$

Convert the following from Standard form to Vertex form.

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

$a = 1$, $b = 8$, $c = 1$

① Find Vertex: $\left(\frac{-b}{2a}, \text{plug in}\right) \rightarrow \left(\frac{-8}{2}, \right)$

vertex $(-4, -15)$

$(-4)^2 + 8(-4) + 1$

② "a" = 1

③ Plug into vertex form:

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

2. $f(x) = x^2 + 10x + 20$

$a = 1$, $b = 10$, $c = 20$

$\left(\frac{-10}{2}, \right) = (-5, -5)$

$(-5)^2 + 10(-5) + 20$

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

3. $f(x) = 3x^2 - 6x + 5$

$a = 3$, $b = -6$, $c = 5$

$\left(\frac{6}{6}, \right)$

$(1, 2)$ $3(1)^2 - 6(1) + 5$

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

4. $f(x) = -2x^2 - 16x - 32$

$a = -2$, $b = -16$, $c = -32$

$\left(\frac{16}{-4}, \right)$

$(-4, 0)$

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