Name: _____   Date: _____

Learning Goal 3.3	Convert standard form of the quadratic equation to vertex form by completing the square.

Standard Form   →   Vertex Form

$$f(x) = ax^2 + bx + c \qquad\qquad f(x) = a(x - p)^2 + g$$

Complete the square on this quadratic function.

$$f(x) = x^2 + 8x + 5$$

1. Start the same way we did in the exploration activity.

$$\left(\frac{8}{2}\right)^2$$
$$= (4)^2$$
$$= 16$$

$$\left(x^2 + 8x\right) + 5$$

$$= \left(x^2 + 8x + 16 - 16\right) + 5$$
factor

2. Add in the rest of the equation.

$$= \left(x^2 + 8x + 16\right) - 16 + 5$$

perfect
square
trinomial

3. Isolate the perfect square trinomial

$$= (x+4)(x+4) - 16 + 5$$

4. Simplify.

$$= (x+4)^2 - 11$$
vertex form

vertex $(-4, -11)$

Assignment   Handout   Quiz Next Day!

Example Convert the following functions into vertex form of the equation.

$(4, -23)$
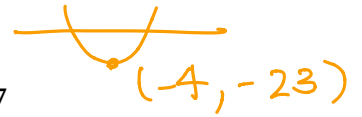
a.　$f(x) = x^2 + 6x + 5$

1.　$\left(\dfrac{6}{2}\right)^2 = (3)^2 = 9$

2.　$= \left(x^2 + 6x + 9 - 9\right) + 5$

3.　$= (x+3)(x+3) - 9 + 5$

4.　$f(x) = (x+3)^2 - 4$

b.　$g(x) = x^2 + 8x - 7$

1.　$\left(\dfrac{8}{2}\right)^2 = (4)^2 = 16$

2.　$= \left(x^2 + 8x + 16 - 16\right) - 7$

3.　$= (x+4)(x+4) - 16 - 7$

4.　$g(x) = (x+4)^2 - 23$

$= (x+9)(x-5)$

c.　$h(x) = x^2 + 7x - 45$

1.　$\left(\dfrac{7}{2}\right)^2 = \dfrac{49}{4}$

2.　$= \left(x^2 + 7x + \dfrac{49}{4} - \dfrac{49}{4}\right) - 45$

3.　$= \left(x + \dfrac{7}{2}\right)\left(x + \dfrac{7}{2}\right) - \dfrac{49}{4} - \dfrac{180}{4}$

4.　$h(x) = \left(x + \dfrac{7}{2}\right)^2 - \dfrac{229}{4}$

d.　$y = x^2 + 19x + 66$

1.　$\left(\dfrac{19}{2}\right)^2 = \dfrac{361}{4}$

2.　$= \left(x^2 + 19x + \dfrac{361}{4} - \dfrac{361}{4}\right) + 66$

3.　$= \left(x + \dfrac{19}{2}\right)\left(x + \dfrac{19}{2}\right) - \dfrac{361}{4} + \dfrac{264}{4}$

4.　$y = \left(x + \dfrac{19}{2}\right)^2 - \dfrac{97}{4}$