

DO NOW

Solve by completing the square:

$$\left(\frac{b}{2}\right)^2$$

$$\left(\frac{6}{2}\right)^2$$

$$9$$

$$x^2 + 6x + 4 = 0$$

$$x^2 + 6x = -4$$

$$x^2 + 6x + 9 = -4 + 9$$

$$(x+3)^2 = 5$$

$$x+3 = \pm\sqrt{5}$$

$$x = -3 \pm \sqrt{5}$$

$$x = -3 + \sqrt{5}$$

or

$$x = -3 - \sqrt{5}$$

8.6 Quadratic Functions in Vertex Form

*** Quadratic functions can be converted from Standard form to Vertex form

$$y = ax^2 + bx + c$$

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

→ by completing the square

Procedure: Starting from standard form

1. Convert to $y - c = ax^2 + bx$
2. Complete the square for the right side
(Add $\left(\frac{b}{2}\right)^2$ to both sides)
3. Simplify the left side and write the right side as a perfect square binomial.
4. Subtract the constant from the left from both sides.

Examples: Rewrite the quadratic function in vertex form.
Identify the vertex and axis of symmetry.

1. $y = x^2 + 6x + 4$
 $y - 4 = x^2 + 6x$
 $y - 4 + 9 = x^2 + 6x + 9$
 $y + 5 = (x+3)^2$
 $y = (x+3)^2 - 5$
 Vertex: $(-3, -5)$
 axis of symmetry: $x = -3$
2. $y = x^2 - 12x + 40$
 $y - 40 = x^2 - 12x$
 $y - 40 + 36 = x^2 - 12x + 36$
 $y - 4 = (x-6)^2$
 $y = (x-6)^2 + 4$
 Vertex: $(6, 4)$
 axis of symmetry: $x = 6$

$$3. y = x^2 + 4x \quad \left(\frac{4}{2}\right)^2 = 4$$

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

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

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

$$\text{Vertex: } (-2, -4)$$

$$\text{axis of symmetry: } x = -2$$

$$4. y = x^2 - 30x + 220$$

$$y - 220 = x^2 - 30x$$

$$y - 220 + 225 = x^2 - 30x + 225$$

$$y + 5 = (x-15)^2$$

$$y = (x-15)^2 - 5$$

$$\text{Vertex: } (15, -5)$$

$$\text{axis of symmetry: } x = 15$$

HOMEWORK

Worksheet - HW 8.6