

Name: _____

Sec. 10.5: Solve Quadratic Equations by Completing the Square

As we continue to look at various methods for solving quadratic equations, recall the relatively simple process of solving when the quadratic expression is a perfect square set equal to 0.

$$x^2 + 8x + 16 = 0 \rightarrow (x + 4)^2 = 0 \rightarrow x + 4 = 0 \rightarrow x = -4$$

We can transform a quadratic into a perfect square through a clever process known as _____ the _____. Consider the example

$$x^2 + 8x - 9 = 0$$

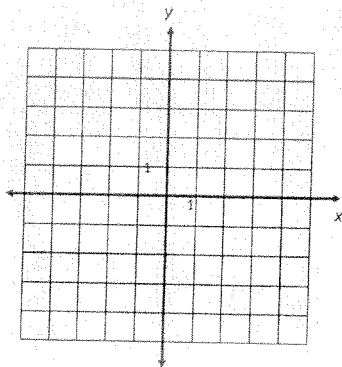
- Move the constant c to the other side of the equation from the x^2 term. $x^2 + 8x = 9$
- Calculate $\frac{1}{2}b$ and then square it. This is what we would like c to be. $(\frac{1}{2} \cdot 8)^2 = 16$
- Add the result from the previous step to each side of the equal sign. $x^2 + 8x + 16 = 25$
- Factor the resulting perfect square. $(x + 4)^2 = 25$
- Take the square root of each side. $x + 4 = \pm 5$
- Solve for x .
 $x = \pm 5 - 4$
 $= -5 - 4, 5 - 4$
 $= -9, 1$

We can also use the idea of perfect squares to write quadratic functions in what's known as _____:

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

The graph of this function will have the same shape as $y = ax^2$ and will be translated h units _____ and k units _____.

Example: Graph $y = 2(x - 1)^2 - 5$.



Examples

Solve each equation by completing the square. Give exact answers.

1. $x^2 + 18x + 45 = 0.$

2. $y^2 + 6y - 38 = 0.$

3. $2v^2 + 16v - 135 = -9.$

4. $g^2 - 19g - 29 = -7g.$

Sec. 10.5 Practice Problems

Solve each equation by completing the square.

1) $m^2 + 10m - 40 = 0$

2) $k^2 + 12k + 35 = 0$

3) $a^2 + 20a + 91 = 0$

4) $p^2 + 4p - 60 = 0$

5) $x^2 - 18x + 77 = 0$

6) $8n^2 - 16n - 27 = -3$

$$7) x^2 + 16x + 40 = -8$$

$$8) 7v^2 + 14v - 26 = -5$$

$$9) 6a^2 - 12a - 14 = 4$$

$$10) 5x^2 + 10x - 70 = 5$$

$$11) x^2 - 20x + 34 = -2$$

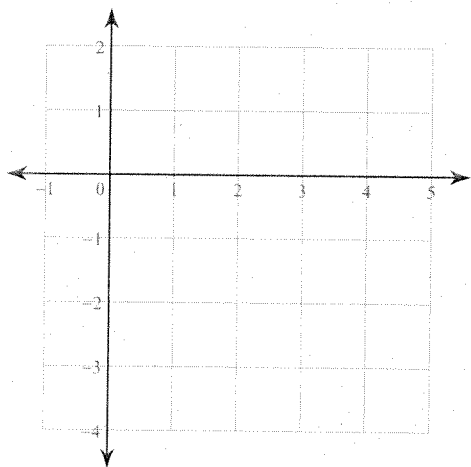
$$12) -x^2 + 18x - 35 = 3 - 5x^2 + 10x$$

$$13) -3n^2 + 16 = 10n - 4n^2$$

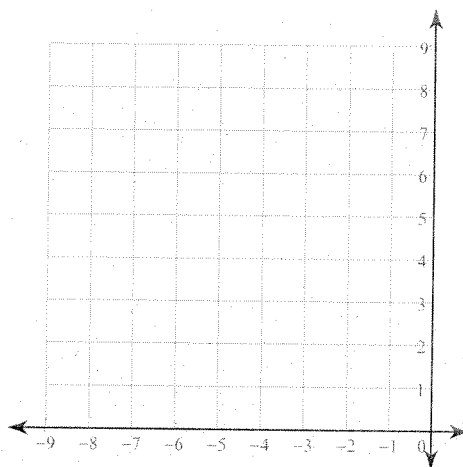
$$14) -5p^2 = 8p + 46 - 6p^2$$

Sketch the graph of each function.

$$15) y = (x - 2)^2 - 3$$



$$16) y = (x + 4)^2 + 4$$



Answers to Sec. 10.5 Practice Problems

1) $\{-5 + \sqrt{65}, -5 - \sqrt{65}\}$

2) $\{-5, -7\}$

3) $\{-7, -13\}$

4) $\{6, -10\}$

5) $\{11, 7\}$

6) $\{3, -1\}$

7) $\{-4, -12\}$

8) $\{1, -3\}$

9) $\{3, -1\}$

10) $\{3, -5\}$

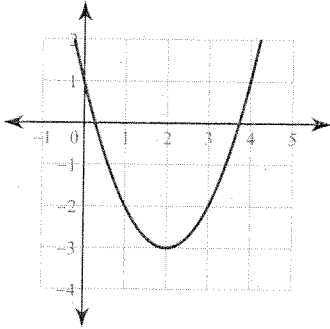
11) $\{18, 2\}$

12) $\left\{\frac{-2 + \sqrt{42}}{2}, \frac{-2 - \sqrt{42}}{2}\right\}$

13) $\{8, 2\}$

14) $\{4 + \sqrt{62}, 4 - \sqrt{62}\}$

15)



16)

