Section 7.2 (Completing the Square)

Quadratic equations are used in engineering applications especially those involving physics and motion. There is a very useful application described in the front of chapter 11. This same application is seen in aeronautics and space flight.

The objective for this section is to:

- Solve quadratic equations by completing the square

To solve a quadratic equation by completing the square you must:

1. Rewrite the equation with the constant on one the right side of the equation. If the coefficient in front of the x^2 term is not 1, you must divide both sides of the equation by that coefficient.
2. Take half of the coefficient of the *x* term; square that value and add it to both sides of the equation.
3. Write the left side of the equation as the square of a binomial and simplify the right side.
4. Take the square root of both sides of the equation.
5. Solve the resulting equation.

Solve by taking the square root of both sides:

1. $x^2 - 16 = 0$

2. $x^2 + 16 = 0$

3. $(x-3)^2 = 25$

4. $(x+5)^2 = -16$

5. $x^2 - 14x + 49 = 7$

Section 7.2 (Completing the Square)

So, how do you complete the square……. (illustrate with factoring squares)

$x^2 + 6x$

$y^2 + 10y$

$x^2 - 5x$

$z^2 - \frac{1}{3}z$

Replace the blanks in each equation with constants to complete the square and form a true equation.

6. $t^2 - 10t + \_\_\_\_\_ = (t - \_\_\_\_)^2$

7. $x^2 + 3x + \_\_\_\_\_ = (x + \_\_\_\_)^2$

8. $t^2 - \frac{5}{6}t + \_\_\_\_\_ = (t - \_\_\_\_)^2$

Let's continue to solve by completing the square.

9. $x^2 + 6x = 7$

10. $t^2 - 10t + 21 = 0$

Section 7.2 (Completing the Square)

11. $x^2 - x - 6 = 0$

12. $a^2 = 4a - 2$

What if the coefficient in front of the x^2 term is not a ONE!

13. $4x^2 + 8x = -3$

Section 7.2 (Completing the Square)

14. $2x^2 - 5x - 3 = 0$

15. $4x^2 + 3x - 5 = 0$

Bonus problem for tonight! Proved the quadratic formula by completing the square on this statement:

$ax^2 + bx + c = 0$

Where the results should equal: $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$