

Quadratic Completing the Square Example

Math 130 *Kovitz*

Solve for x .

$$x^2 + 220x + 12000 = 0.$$

Decide on a method of solution. Then either isolate the x terms (if completing the square) or set the right side to 0 (if factoring or using the quadratic formula).

Do not isolate the x terms on one side and divide both sides by the coefficient after factoring out an x . That's definitely not correct; it is not a linear equation, so methods for solving a linear equation are not applicable.

It is always a good idea to check the solutions in the *original* equation, using a calculator if necessary.

$$x^2 + 220x + 12000 = 0.$$

The x^2 has coefficient 1, and x has an even integr coefficient, so complete the square.

$$x^2 + 220x = -12000.$$

Get all the x terms on the left side of the equation and all the constants on the right side.

$$x^2 + 220x + 110^2 = -12000 + 110^2.$$

Take half the coefficient of the x term and square it.

That is the completing number, so add it to both sides of the equation.

$$(x + 110^2) = -12000 + 12100 = 100.$$

Writing each side as a perfect square.

$$x + 110 = \pm 10$$

Take square roots of both sides introducing “plus or minus.”

$$x = -110 \pm 10$$

Subtract 110 from both sides.

$$x = -100 \text{ or } x = -120$$

Check the answers.

$$(-100)^2 + 220(-100) + 12000 = 0.$$

$$10000 - 22000 + 12000 = 0.$$

It checks.

and

$$(-120)^2 + 220(-120) + 12000 = 0.$$

$$14400 - 26400 + 12000 = 0.$$

So, both answers check. Use of a calculator is recommended.