Lesson 14: Deriving the Quadratic Formula

Classwork

Opening Exercises

1. Solve for x by completing the square: $x^2 + 2x = 8$.

2. Solve for p by completing the square: $7p^2 - 12p + 4 = 0$.

Discussion

Solve $ax^2 + bx + c = 0$.

Exercises

Use the quadratic formula to solve each equation.

1. $x^2 - 2x = 12 \rightarrow a = 1,\ b = -2,\ c = -12$ (Watch the negatives.)

2. $\frac{1}{2}r^2 - 6r = 2 \rightarrow\ a = \frac{1}{2},\ b = -6,\ c = -2$ (Did you remember the negative?)

3. $2p^2 + 8p = 7 \rightarrow\ a = 2,\ b = 8,\ c = -7$

4. $2y^2 + 3y - 5 = 4\ \rightarrow\ a = 2,\ b = 3,\ c = -9$

Exercise 5

Solve these quadratic equations, using a different method for each: solve by factoring, solve by completing the square, and solve using the quadratic formula. Before starting, indicate which method you will use for each.

Method ______________ $2x^2 + 5x - 3 = 0$

Method ______________ $x^2 + 3x - 5 = 0$

Method ______________ $\frac{1}{2}x^2 - x - 4 = 0$

Lesson Summary

The quadratic formula, $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$, is derived by completing the square on the general form of a quadratic equation: $ax^2 + bx + c = 0$, where $a \neq 0$. The formula can be used to solve any quadratic equation, and is especially useful for those that are not easily solved using any other method (i.e., factoring or completing the square).

Problem Set

Use the quadratic formula to solve each equation.

1. Solve for z: $z^2 - 3z - 8 = 0$.

2. Solve for q: $2q^2 - 8 = 3q$

3. Solve for m: $\frac{1}{3}m^2 + 2m + 8 = 5$.