

**P.5 SOLVING EQUATIONS GRAPHICALLY, NUMERICALLY, AND ALGEBRAICALLY**

## Learning Targets for P.5

1. Solve equations graphically with a calculator (2 ways)
2. Solve quadratic equations algebraically:  $x^2$  but no  $x$ ,  $x^2$  and  $x$  but no  $c$ ,  $x^2$  and  $x$  and  $c$ , undo  $(\dots)^2$
3. Complete the square
4. Solve Absolute value equations

Being able to solve equations in multiple ways allows you to answer a question using the easiest method possible. Another advantage of having multiple ways to solve an equation is that it gives you an opportunity to check your work.

The three methods are obvious from the title of the section ... Graphically, Numerically, and Algebraically.

Solve an Equation by Graphing

There are two keys to solving an equation by graphing.

1. Understanding WHERE the solution(s) is(are).
2. Finding those solutions using your calculator (or a hand drawn graph).

Solutions are located in \_\_\_\_\_ possible places, either the \_\_\_\_\_ or \_\_\_\_\_.

*Example 1:* Solve the equation  $2x^2 - 5x = 3$  by graphing the left side of the equation and the right side of the equation.

- a) Where is(are) the solution(s) to this equation located?
- b) What is the solution to this equation?

*Example 2:* Solve the equation  $2x^2 - 5x = 3$  by setting one side equal to 0, and graphing the other side.

- a) Where is(are) the solution(s) to this equation located?
- b) What is the solution to this equation?

*Example 3:* Graphically solve the equation  $x^3 + x^2 + 2x - 3 = 0$ . Describe your method.

*Example 4:* Solve the equation  $2^x = x^2$  graphically.

- a) Solve by finding the intersections.
- b) Solve by finding the zeros.

Solve an Equation Numerically

Typically, you will be given a table of values when asked to solve an equation numerically. You could also create the table yourself.

Zeros occur when there is a \_\_\_\_\_ change in the \_\_\_\_\_ values in the table.

The zero is between the \_\_\_\_\_ values in the table, where the \_\_\_\_\_ occurs.

*Example 5:* Use the table to approximate the zero of the function,  $y = -x^3 + x + 1$ .

$x$	$y$
1.1	0.769
1.2	0.472
1.3	0.103
1.4	-0.344
1.5	-0.875
1.6	-1.496
1.7	-2.213

Solve an Equation Algebraically

This is the method you have spent the most time using in math classes so far. We are going to focus on various methods of solving quadratic equations on these notes.

*Example 6:* Method 1: Solve by extracting square roots.

a)  $(2y + 3)^2 = 16$

b)  $2(x - 4)^2 = 10$

*Example 7:* Method 2: Solve by completing the square.

a)  $x^2 + 6x = 7$

b)  $2x^2 + 5x - 12 = 0$

*Example 8:* Method 3: Solve using the quadratic formula.

a)  $2x^2 - x - 3 = 0$

b)  $3x^2 - 6x - 7 = x^2 + 3x - x(x+1) + 3$

*Example 9:* Method 4: Solve by factoring. Support your work graphically.

a)  $x^2 - x - 6 = 0$

b)  $4x^2 + 3 = 8x$