Quadratics 2a - Quadratic Functions: Solving Factored Form

Standards: **F-IF.4** & **F-IF.7**

GLOs: #1 Self Directed Learner

Math Practice: Make sense of problems & persevere in solving them

Learning Target: How does the Zero-Product Property help us solve quadratic functions?

Aug 26-9:36 PM

One of the more important challenges throughout Algebra is to solve equations. As you are exposed to an ever increasing variety of functions it is important to identify the type of equation you are attempting to solve because the techniques used to solve equations is different depending on the type of equation.

Solve the following linear equations:

a. $2x - \cancel{1} = 3$ x = 2

$\cancel{+1} \quad +1$

$\frac{\cancel{2}x}{\cancel{2}} = \frac{4}{2}$

$x = 2$

b. $-x - \cancel{1} = -2$ x = 1

$\cancel{+1} \quad +1$

$\frac{\cancel{-}x}{\cancel{-1}} = \frac{-1}{-1}$

$x = 1$

Sep 2-12:37 AM

You will learning a variety of techniques for solving certain types of *Quadratic Equations.*

(erase to show)

Definition: A quadratic function in ***factored form*** is one that is written as $f(x)=a(x-s)(x-t)$, where *a, s,* and *t* are [possibly negative] real numbers, *a* not equal to zero.

$f(x)=ax^2+bx+c$

$f(x)=2(x-1)(x+3)$

$x^2+3x-1x-3$

$2(x^2+2x-3)$

$f(x)=2x^2+4x-6$

Sometimes we can use factored form to solve quadratic equations.

Example 1: Solve $(x - 1)(x + 3) = 0$.

Notice, this equation is of the form A * B = 0, where $A = (x-1)$ and $B = (x+3)$

Use the **Zero-Product Property: if A*B=0 then A=0 or B=0**

Thus, either $x - 1 = 0$ or $x + 3 = 0$. So, by using the Zero-Product Property, we can reduce our quadratic equation to *two* linear equations. And, we know that linear equations can be solved by applying balancing equations techniques.

There are two solutions to this quadratic equation, each one corresponding to one of the factors.

$$x - \cancel{1} = 0 \qquad \text{or} \qquad x + \cancel{3} = 0$$

$$\cancel{+1} \quad +1 \qquad\qquad -\cancel{3} \quad -3$$

$$x = 1 \qquad\qquad x = -3$$

$$\boxed{x = 1, -3}$$

$$\boxed{x = 1 \,\&\, -3}$$

Use the Zero-Product Property to solve the following quadratic equations presented in factored form. Show all work!

1. $(x - 4)(x + 10) = 0$ x = 4 & -10

$x - \cancel{4} = 0$ $\quad$ $x + \cancel{10} = 0$

$\cancel{+4} \quad +4$ $\quad$ $-\cancel{10} \quad -10$

$x = 4$ $\quad$ $x = -10$

2. $(x + \frac{1}{4})(x + 9) = 0$ x = $-\frac{1}{4}$ & -9

$x + \cancel{\tfrac{1}{4}} = 0$ $\quad$ $x + \cancel{9} = 0$

$-\cancel{\tfrac{1}{4}} \quad -\frac{1}{4}$ $\quad$ $-\cancel{9} \quad -9$

$x = -\frac{1}{4}$ $\quad$ $x = -9$

3. $2(x - 4)(x + 10) = 0$ x = 4 & -10

$\cancel{2 = 0}$ $\quad$ $x - \cancel{4} = 0$ $\quad$ $x + \cancel{10} = 0$

$\cancel{+4} \quad +4$ $\quad$ $-\cancel{10} \quad -10$

$x = 4$ $\quad$ $x = -10$

4. $2x(x + 10) = 0$ x = 0 & -10

$\frac{\cancel{2}x}{\cancel{2}} = \frac{0}{2}$ $\quad$ $x + \cancel{10} = 0$

$-\cancel{10} \quad -10$

$x = 0$ $\quad$ $x = -10$

5. $(x - 40)(x + 100) = 0$ x = 40 & -100

$x - \cancel{40} = 0$ $\quad$ $x + \cancel{100} = 0$

$\cancel{+40} \quad +40$ $\quad$ $-\cancel{100} \quad -100$

$x = 40$ $\quad$ $x = -100$

Reflection: Why would it be difficult to use a table of values to solve the above?

- to solve these equations we would a huge table.

Reflection: Why can't you use the Zero-Product Property to solve $(x - 1)(x + 3) = 6$?

- this does not equal 0.

$$6 = 1 \cdot 6 = 2 \cdot 3$$

$$\left.\begin{array}{ll} x-1=1 & x+3=6 \\ x-1=6 & x+3=1 \\ x-1=2 & x+3=3 \\ x-1=3 & x+3=2 \end{array}\right\} \text{too many options}$$

Sep 2-12:55 AM

Entrance Pass: Due at next class

Solve the following using the Zero-Product Property.

$$(2x-5)(x+9)=0$$