9.2: Solving Quadratic Equations by Graphing DAY ONE

Essential Question

How can you use a graph to solve a quadratic equation in one variable?

Maintaining Mathematical Proficiency:

$y = mx + b$ *move on*

Factor the trinomial.

$x^2 - 6x + 9$

$(x-3)(x-3)$

$\dfrac{9}{1 \quad 9}$
$-3 \quad -3$

$(x-3)^2$

Solve the linear system by graphing.

begin

$b = -1$
$m = \dfrac{2}{1}$ $y = 2x - 1$

$y = -3x + 9$

$b = 9$

$m = -3 = \dfrac{-3}{1}$

$(2, 3)$
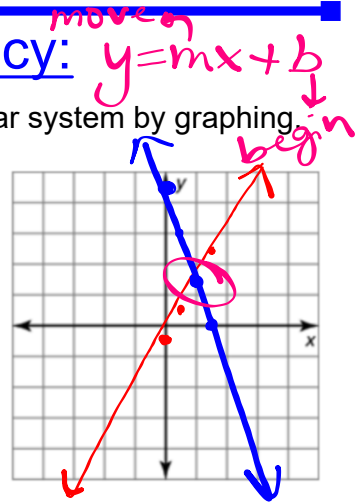
Essential Question

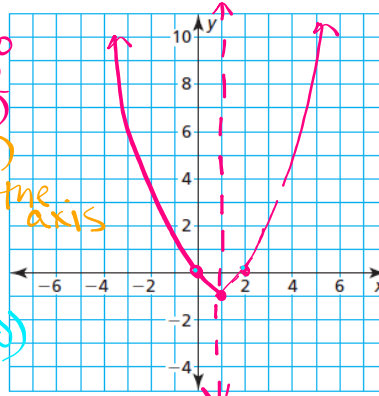a. Sketch the graph of $y = x^2 - 2x$. +0   *quadratic*

$\cup$ $(1, -1)$ $\dfrac{-b}{2a} = \dfrac{-(-2)}{2(1)}$

b. What is the definition of an x-intercept of a graph? $(x, 0)$

point where your graph hits the axis

How many x-intercepts does this graph have?   2

What are they? $(0, 0)$ & $(2, 0)$

zeros
solutions
roots
x-intercepts ←   → what makes the equation true.

c. What is the definition of a solution of an equation in x? How many solutions does the equation $x^2 - 2x = 0$ have? What are they?

2

$x^2 - 2x = 0$

GCF $x(x-2) = 0$
ZPP $x = 0 \quad x - 2 = 0$

$x = 0, 2$

d. Explain how you can verify the solutions you found in part (c).

plugging back into the equation

Exploration 1

1

9.2 Solving Quadratics by Graphing DAY ONE with work

Core Concept

Solving Quadratic Equations by Graphing

Step 1 Write the equation in standard form, $ax^2 + bx + c = 0$.

Step 2 Graph the related function $y = ax^2 + bx + c$.

→ roots, solution, zeros

Step 3 Find the x-intercepts, if any. $(x, 0)$

The solutions, or *roots*, of $ax^2 + bx + c = 0$ are the x-intercepts of the graph.

zeros

1) Find the vertex. $\left(-\frac{b}{2a}, y\right)$

2) Pick 2 #'s above/below the vertex $\frac{x|y}{}$

3) Make a t-chart $\frac{x|y}{}$

Core Concept

Solve $x^2 + 2x = 8$ by graphing. $ax^2 + bx + c$

$-8 \quad -8$

1. $x^2 + 2x - 8 = 0$

2. $x = -\frac{b}{2a} = \frac{-2}{2(1)} = \frac{-2}{2} = -1$

$(-1)^2 + 2(-1) - 8 \quad (-1, -9)$

$1 - 2 - 8 = -9$

3.

x	y
-3	-5
-2	-8
-1	-9
0	-8
1	-5

$(0)^2 + 2(0) - 8$
$(1)^2 + 2(1) - 8$

$\boxed{x = 2, -4}$

4. $0 = x^2 + 2x - 8$ $\frac{-8}{1 \quad 8}$

$0 = (x-2)(x+4)$ $\boxed{-2 \quad 4}$

$x - 2 = 0 \quad x + 4 = 0$

$x = 2 \qquad x = -4$

$(2, 0) \qquad (-4, 0)$

Example 1

2

Solve $x^2 + 4x = -4$ by graphing.

1. $x^2 + 4x + 4 = 0$
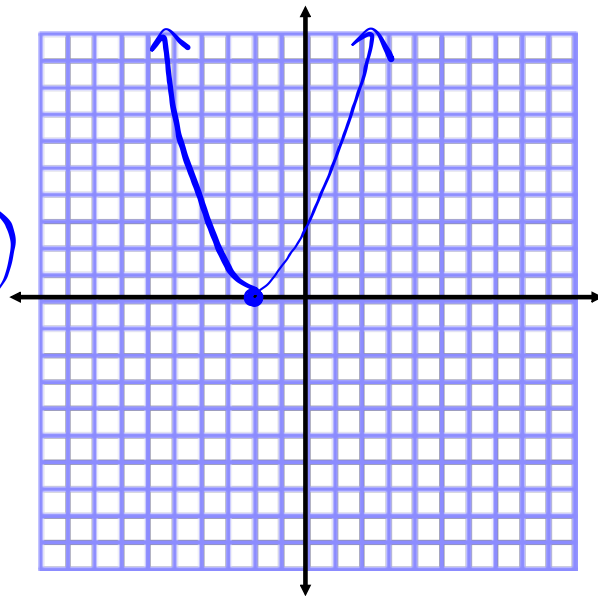
2. $\dfrac{-b}{2a} = \dfrac{-4}{2(1)} = -2$

$(-2)^2 + 4(-2) + 4 \quad (-2, 0)$

$4 - 8 + 4 = 0$

$\boxed{x = -2}$

$(x+2)(x+2)$

$(x+2)^2$

Example 2

Solve $-x^2 = 4x + 8$ by graphing.

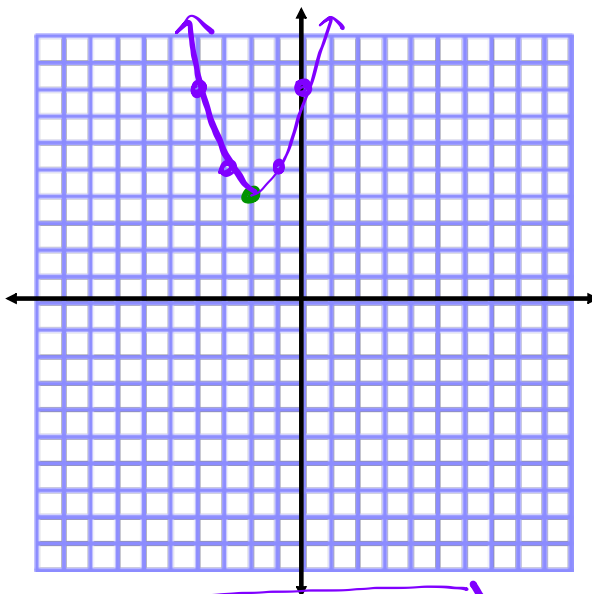1. $0 = x^2 + 4x + 8$

2. $\dfrac{-b}{2a} = \dfrac{-4}{2(1)} = -2$

$(-2)^2 + 4(-2) + 8 \quad (-2, 4)$

$4 - 8 + 8 = 4$

3.

x	y
-4	8
-3	5
-2	4
-1	5
0	8

$(-1)^2 + 4(-1) + 8$

$(0)^2 + 4(0) + 8$

$\boxed{\text{no real solutions}}$

Example 3

3

The graph of $f(x) = (x - 3)(x^2 - x - 2)$ is shown. Find the zeros off.
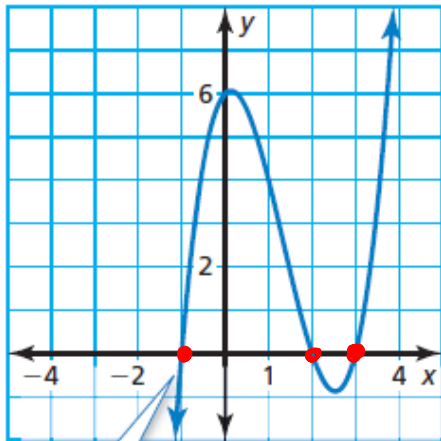
$\rightarrow$ roots
$\rightarrow$ solutions

$X = -1, 2, 3$

$f(x) = (x - 3)(x^2 - x - 2)$

$x-3=0 \qquad (x-2)(x+1)$
$x=3 \qquad x-2=0 \quad x+1=0$
$\qquad\qquad x=2 \qquad x=-1$

Example 4

The graph of $f(x) = x^2 + 4x + 1$ is shown. Approximate the zeros of f to the nearest tenth.

$\rightarrow -3.75$

$\rightarrow -0.25$

$X = -3.8, -0.3$

$f(x) = x^2 + 4x + 1$

Example 5

4
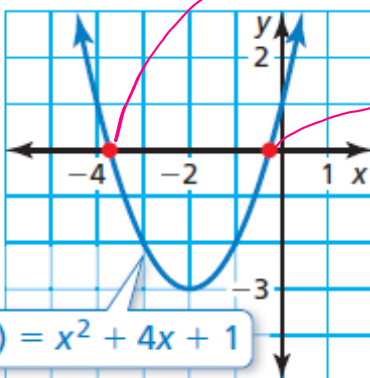
HW Assignment 9.1 Day One:

9.1 WS from the WB odds