Name: _____ Date: _____ Hour: ____Alg 1____

Unit 7B Day 13: Introduction to *Imaginary* numbers!

Focus Question: Are there really no solutions if there are no x-intercepts?

A. Review

1. What were the other names for x intercepts? Explain why they have these names.

roots zeros solutions

2. A linear function always has 1 x intercepts (or solutions) and it is degree 1.

3. A quadratic can have 0, 1, or 2 x-intercepts.

4. A quadratic is degree 2.

$y=mx+b$ (1) $f(x)=a(x-h)^2+k$ (2)

B. The Fundamental Theorem of Algebra

1. What does fundamental mean? basic & necessary

2. **The fundamental theorem of algebra: A polynomial of degree *n* will have exactly *n* roots.**

So if a quadratic is degree 2, **it has to have** 2 roots.

3. Graph and solve each of the following in a different color

a. $f(x)=x^2-4$

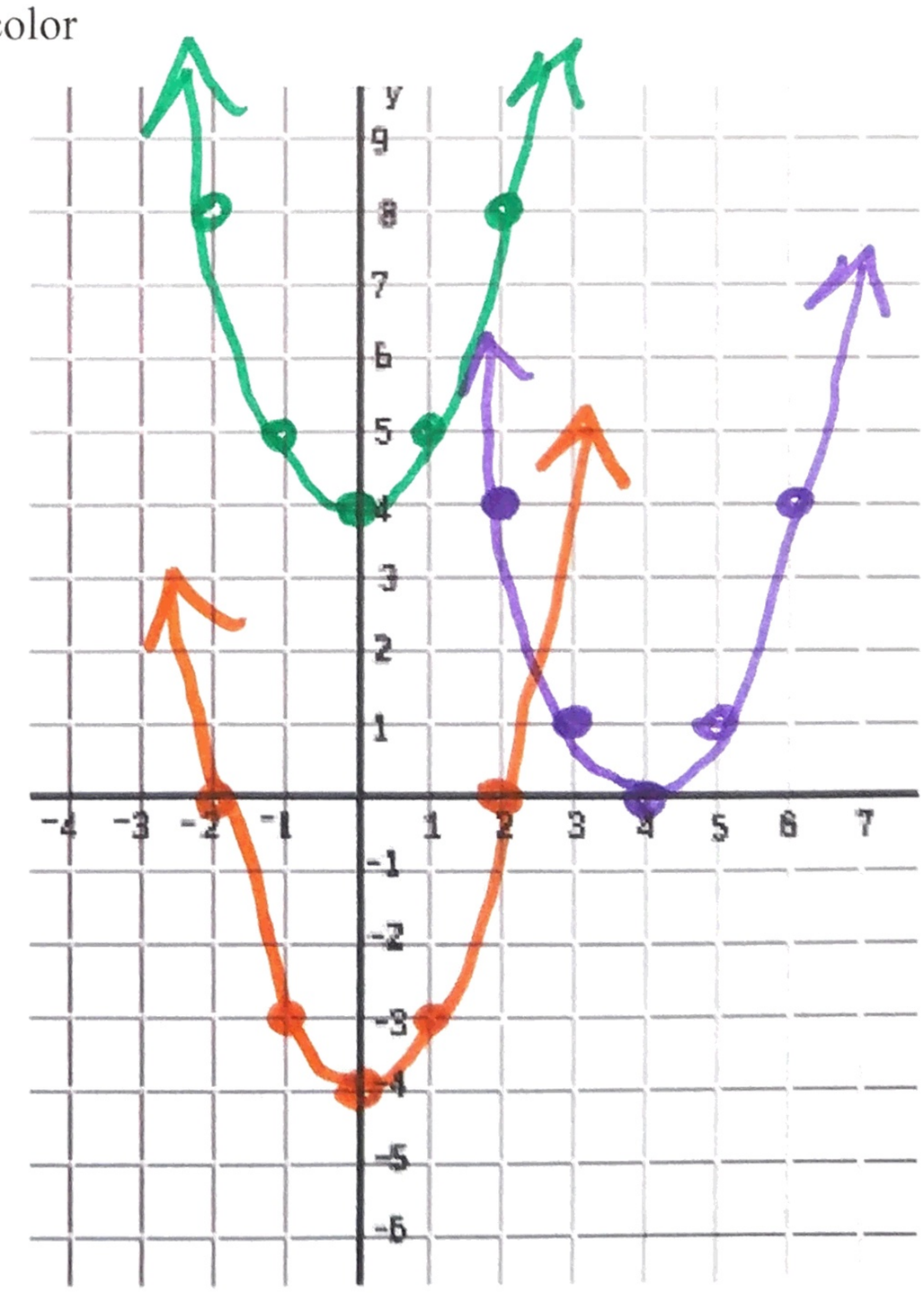
$0=x^2-4$

$+4 \quad +4$

$\sqrt{4}=\sqrt{x^2}$

$x=\pm 2$

(2,0) (-2,0)



When a quadratic has two x intercepts we say it has two *real* solutions.

b. $g(x)=(x-4)^2$

$\sqrt{0}=\sqrt{(x-4)^2}$

$0=x-4$

$+4 \quad +4$

$x=4$

(4,0)

When a quadratic has one x intercept, we say it has one real (repeated) solution and it is always the vertex

c. $h(x)=x^2+4$

$0=x^2+4$

$-4 \quad -4$

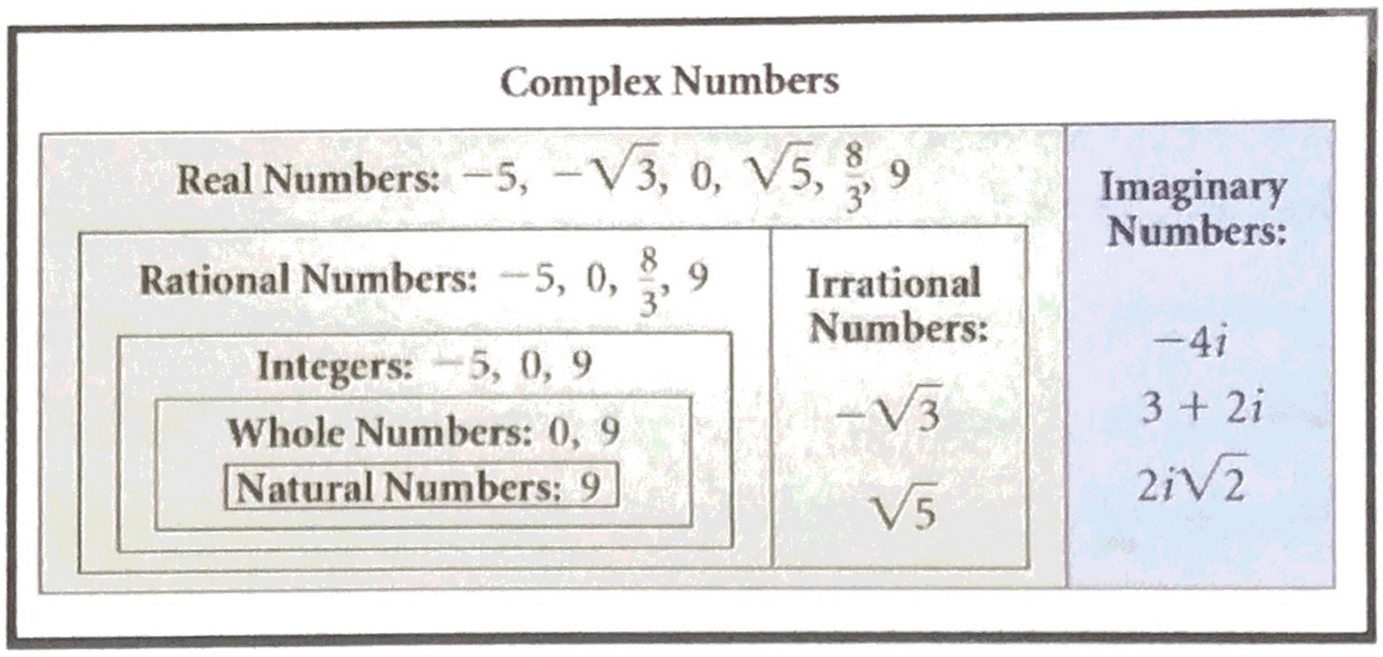
$\sqrt{-4}=\sqrt{x^2}$

$x=\sqrt{-4}$

When a quadratic has no x intercepts we say it has no *real* solutions. <u>But that doesn't mean that it doesn't have solutions!</u>

C. The complex number system

When a quadratic has no x intercepts, we say it has no *real* solutions or two *complex* solutions.



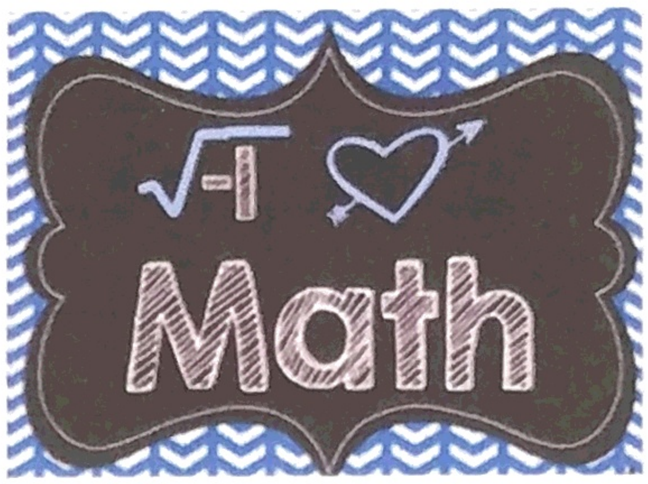
They are called complex solutions because they involve imaginary numbers. See video for intro to imaginary numbers. http://viewpure.com/T647CGsuOVU?start=0&end=0

The person who "created" imaginary numbers felt they should be called lateral.

Have you ever seen something like this?

Mathematicians find the humor because

$\sqrt{-1} = i$ so it says i ♡ Math



So what is $\sqrt{-4}$?

$$\sqrt{-4} = \sqrt{4 \cdot -1} = \sqrt{4} \cdot \sqrt{-1} = \pm 2i$$

Simplify each square root.

1. $\sqrt{-25}$
$\sqrt{25 \cdot -1}$
$\sqrt{25} \cdot \sqrt{-1}$
$\pm 5i$

2. $\sqrt{-121}$
$\sqrt{121 \cdot -1}$
$\pm 11i$

3. $\sqrt{-81}$
$\sqrt{-81}$
$\sqrt{81 \cdot -1}$
$\pm 9i$

4. $\sqrt{-225}$
$\sqrt{225 \cdot -1}$
$\pm 15i$

5. $\sqrt{-37}$
$\sqrt{-1 \cdot 37}$
$i\sqrt{37}$

6. $\sqrt{-2}$
$\sqrt{-1 \cdot 2}$
$i\sqrt{2}$

7. $\sqrt{-105}$
$\sqrt{-1 \cdot 105}$
$i\sqrt{105}$

8. $\sqrt{-22}$
$\sqrt{-1 \cdot 22}$
$i\sqrt{22}$

9. ~~$\sqrt{40}$~~ $\sqrt{-40}$
$\sqrt{4 \cdot 10 \cdot -1}$
$\sqrt{4}\ \sqrt{-1}\ \sqrt{10}$
$\pm 2i\sqrt{10}$

10. ~~$\sqrt{300}$~~ $\sqrt{-300}$
$\sqrt{100 \cdot -1 \cdot 3}$
$\pm 10i\sqrt{3}$

11. ~~$\sqrt{147}$~~ $\sqrt{-147}$
$\sqrt{49 \cdot -1 \cdot 3}$
$\pm 7i\sqrt{3}$

12. ~~$\sqrt{80}$~~ $\sqrt{-80}$
$\sqrt{4 \cdot -1 \cdot 20}$
$\pm 2i\sqrt{20}$
$\pm 2i\sqrt{4 \cdot 5}$
$\pm 2i \cdot 2\sqrt{5}$
$\pm 4i\sqrt{5}$