Quadratics with no x-intercepts:

When a parabola has no x-intercepts, we tend to talk about these intercepts as being **imaginary**.
In mathematics, imaginary numbers are an actual thing!

Example 1: Solve $y = 2(x+1)^2 + 8$

$$0 = -2(x+1)^2 \cancel{+8}$$
$$-8 \qquad\qquad \cancel{-8}$$

$$\frac{-8}{-2} = \frac{-2(x+1)^2}{-2}$$

$$\pm\sqrt{4} = \sqrt{(x+1)^2}$$

$(-3, 0)$

$(1, 0)$

<u>Example 2:</u> **Solve** $y = 3x^2 - 5x + 6$

$a=3 \quad b=-5 \quad c=6$

$$x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(3)(6)}}{2(3)}$$

$$x = \frac{5 \pm \sqrt{-47}}{6}$$

Practice Simplifying Radicals

$\sqrt{-81}$

$\sqrt{81} = 9$

$\sqrt{-1} \cdot \sqrt{81}$

$\boxed{\sqrt{-1} \cdot 9}$

$\boxed{9i}$

$\sqrt{-45} = \sqrt{-1}\ \sqrt{45}$

45

$5 \quad 9$

$\cancel{3} \quad \cancel{3}$

$\boxed{3\sqrt{5}\sqrt{-1}}$

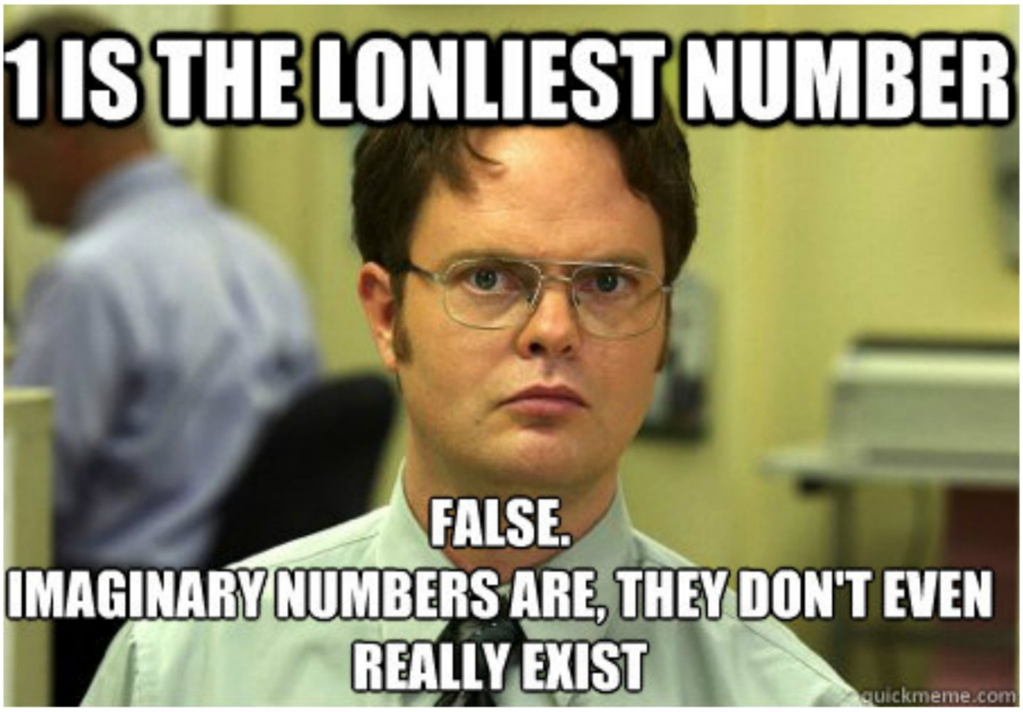
$\boxed{3i\sqrt{5}}$

Before the Video:

1. In your own words, explain what it means to find an "imaginary solution" for the graph.

2. Brainstorm in what ways imaginary numbers could apply to real-world math. Record your thoughts.

3. Look up the word "lateral" and write down the definition. You will hear it used in the vieo and will later reflect on the way in which it was used.


1 IS THE LONLIEST NUMBER
FALSE.
IMAGINARY NUMBERS ARE, THEY DON'T EVEN
REALLY EXIST
quickmeme.com

During the Video:

1. How does the speaker define an "imaginary solution?" What does he say it means for the graph?

2. The speaker goes on to compare imaginary numbers to negative numbers and zero. In what way(s) are they similar?

After the Video:

1. What topics or real-world applications do you think could involve imaginary numbers?

$a + bi$

2. Looking back at your definition of lateral, why do you think mathematicians thought this would be a good name for imaginaries?

3. How does the idea of a different "dimension" of numbers affect your prospective of math?

Imaginary Numbers: a number that when squared has a negative result

$i = \sqrt{-1}$

When we come across the square root of a negative number, we know this is impossible to evaluate, so we kick out the negative & turn it into an i.

Example 2: $y = 3x^2 - 5x + 6$

$$\frac{5 \pm \sqrt{-47}}{6}$$

$$\left(\frac{5+i\sqrt{47}}{6}, 0\right)$$

$$\left(\frac{5-i\sqrt{47}}{6}, 0\right)$$

$$= \frac{5 \pm i\sqrt{47}}{6}$$

<u>Example 3:</u> Solve $2x^2 - 4 = -5x - 10$

$$\begin{aligned} &\quad\ \ +5x \quad +5x \\ &2x^2+5x-4=-10 \\ &\qquad\quad\ +10 \quad +10 \\ &2x^2+5x+6=0 \end{aligned}$$

$a=2$
$b=5$
$c=6$

$$x=\frac{-5\pm\sqrt{(5)^2-4(2)(6)}}{2(2)}$$

$$x=\frac{-5\pm\sqrt{-23}}{4}\ \boxed{=\frac{-5\pm i\sqrt{23}}{4}}$$

$\left(\frac{-5+i\sqrt{23}}{4}, 0\right)$

$\left(\frac{-5-i\sqrt{23}}{4}, 0\right)$

Try one on your own!

Solve: $y = 4(x+5)^2 + 16$

$0 = 4(x+5)^2 + 16$

$-16 \qquad\qquad -16$

$\frac{-16}{4} = \frac{4(x+5)^2}{4}$

$-4 = (x+5)^2$

$\pm\sqrt{-4} = \pm\sqrt{(x+5)^2}$

$\sqrt{-1}\sqrt{4}$

$\pm 2i = x+5$

① $x+5 = 2i$

$\boxed{x = 2i-5}$

② $x+5 = -2i$

$\boxed{x = -2i-5}$

$(2i-5, 0)$ $(-2i-5, 0)$

Homework is Page 6 in Packet