Unit 3 Lesson 7: Inequivalent Equations

1 2 and -2 (Warm up)

Student Task Statement

What do you notice? What do you wonder?

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

2 Careful When You Take the Square Root

Student Task Statement

Tyler was solving this equation:

$$x^2 - 1 = 3$$

He said, "I can add 1 to each side of the equation and it doesn't change the equation. I get $x^2 = 4$."

1. Priya said, "It does change the equation. It just doesn't change the solutions!" Then she showed these two graphs.

Figure A

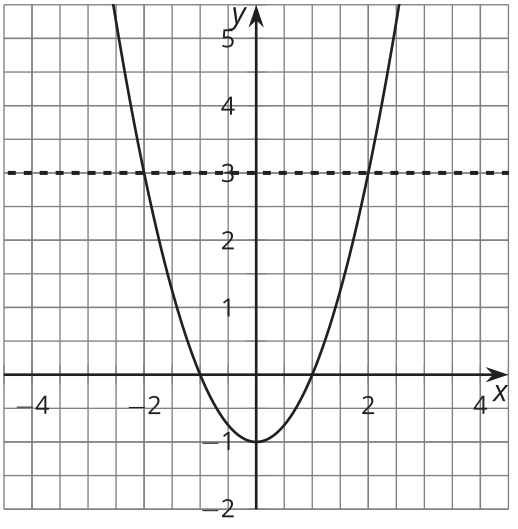
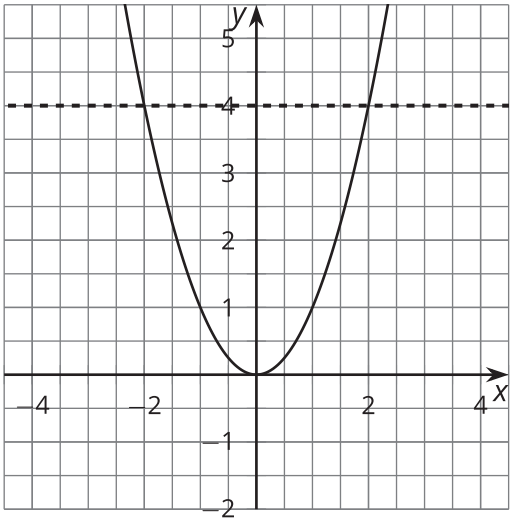


Figure B



   a. How can you see the solution to the equation $x^2 - 1 = 3$ in Figure A?

   b. How can you see the solution to the equation $x^2 = 4$ in Figure B?

   c. Use the graphs to explain why the equations have the same solutions.

2. Tyler said, "Now I can take the square root of each side to get the solution to $x^2 = 4$. The square root of x^2 is x. The square root of 4 is 2." He wrote:

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

   Priya said, "But the graphs show that there are *two* solutions!" What went wrong?

3 Another Way to Solve

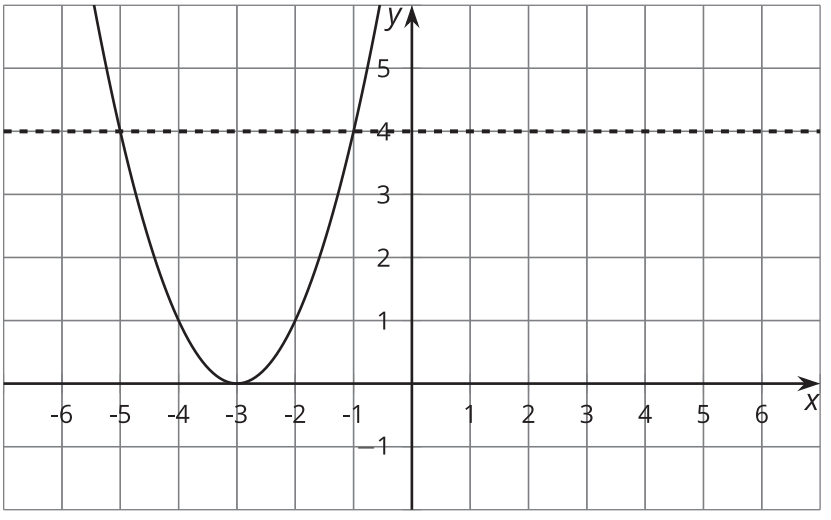
Student Task Statement

Han was solving this equation: $\frac{x+3}{2} = 4$

He said, "I know that half of $x + 3$ is 4. So $x + 3$ must be 8, since half of 8 is 4. This means that x is 5."

1. Use Han's reasoning to solve this equation: $(x + 3)^2 = 4$.
2. What advice would you give to someone who was going to solve an equation like $(x + 3)^2 = 4$?

Activity Synthesis



4 What Happens When You Square Each Side?

Student Task Statement

Mai was solving this equation: $\sqrt{x-1} = 3$

She said, "I can square each side of the equation to get another equation with the same solutions." Then she wrote:

$$\begin{aligned} \sqrt{x-1} &= 3 \\ (\sqrt{x-1})^2 &= 3^2 \\ x-1 &= 9 \\ x &= 10 \end{aligned}$$

1. Check to see if her solution makes the original equation true.
2. Andre said, "I tried your technique to solve $\sqrt{x-1} = -3$but it didn't work." Why doesn't it work? Explain or show your reasoning.

5 Solve These Equations With Square Roots in Them (Optional)

Student Task Statement

Find the solution(s) to each of these equations, or explain why there is no solution.

1. $\sqrt{t+4} = 3$
2. $-10 = -\sqrt{a}$
3. $\sqrt{3-w} - 4 = 0$
4. $\sqrt{z} + 9 = 0$