

Name _____ Date _____ Period _____

Extraneous Solutions and Real-World Applications

Algebra II | Unit 2 | Day 6 | TEK A2.6.D, A2.6.E

Objective: I can identify extraneous solutions when solving absolute value equations, and solve the real-world equations from Day 4.

Vocabulary

Extraneous solution: a value the algebra produces that does _____ actually satisfy the _____ equation.

KEY IDEA

Step 1 - Split: $|A| = B$ becomes $A = B$ OR $A = -B$, same as always.

Step 2 - Solve: solve each branch for x .

Step 3 - Check: plug EVERY answer into the ORIGINAL equation - reject any that fail.

Step 4 - Desmos check: graph each side as y_1/y_2 - real solutions are where they cross.

Let's Work Through It

Example 1 — Solve $3|x - 1| - 2 = 6x + 1$. The variable is on both sides, so check every answer.

Isolate: $3|x - 1| =$ _____ $\rightarrow |x - 1| =$ _____

Split: $x - 1 = 2x + 1$ OR $x - 1 =$ _____

Solve: $x =$ _____ or $x =$ _____

Check $x = -2$: $3|-3| - 2 = 7$, $6(-2) + 1 = -11$. $7 \neq -11 \rightarrow$ _____

Check $x = 0$: $3|-1| - 2 = 1$, $6(0) + 1 = 1$. $1 = 1 \rightarrow$ _____ Solution set: {_____}

Desmos check: Type $y_1 = 3|x - 1| - 2$ and $y_2 = 6x + 1$ into two input boxes. The graphs cross only at $x =$ _____ - there is no crossing at $x = -2$, confirming it was extraneous.

Example 2 — Recall Day 4: Clarissa wants a house within 5 houses of #1248 on an even-numbered street, giving $|x - 1248| = 5$. Solve, and check both against the situation.

$x =$ _____ or $x =$ _____

Example 3 — Recall Day 4: a surveying instrument has a 1.5% margin of error on a 10-mile stretch, giving $1.5 = |x - 10|/10 \cdot 100$. Solve it.

$$|x - 10| = \underline{\hspace{2cm}} \quad x = \underline{\hspace{2cm}} \quad \text{or} \quad x = \underline{\hspace{2cm}} \text{ miles}$$

Example 4 — Recall Day 4: an AI demand-forecasting model is trusted only within 25 units of an actual demand of 400 units, giving $|x - 400| = 25$. Solve for the acceptable prediction range.

$$x = \underline{\hspace{2cm}} \quad \text{or} \quad x = \underline{\hspace{2cm}} \quad \underline{\hspace{2cm}}$$

Example 5 — Solve $|x + 3| = 2x + 1$, and check both solutions.

$$\text{Split: } x + 3 = 2x + 1 \quad \text{OR} \quad x + 3 = \underline{\hspace{2cm}}$$

$$\text{Solve: } x = \underline{\hspace{2cm}} \quad \text{or} \quad x = \underline{\hspace{2cm}}$$

$$\text{Check } x = 2: |2 + 3| = 5, \quad 2(2) + 1 = 5. \quad 5 = 5 \rightarrow \underline{\hspace{2cm}}$$

$$\text{Check } x = -4/3: |-4/3 + 3| = 5/3, \quad 2(-4/3) + 1 = -5/3. \quad 5/3 \neq -5/3 \rightarrow \underline{\hspace{2cm}}$$

$$\text{Solution set: } \{\underline{\hspace{2cm}}\}$$

Your Turn

You Try 1 — Solve $|2x - 1| = x + 4$, and check both solutions.

$$x = \underline{\hspace{2cm}} \quad \text{or} \quad x = \underline{\hspace{2cm}} \quad \text{Solution set: } \{\underline{\hspace{2cm}}\} \underline{\hspace{2cm}}$$

You Try 2 — Solve $|x - 4| = 3x$, checking both solutions in the ORIGINAL equation. State the solution set.

$$x = \underline{\hspace{2cm}} \quad \text{or} \quad x = \underline{\hspace{2cm}} \quad \text{Solution set: } \{\underline{\hspace{2cm}}\}$$