

Graphing Technology Lab

Solving Radical Equations and Inequalities

You can use TI-Nspire technology to solve radical equations and inequalities. One way to do this is to rewrite the equation or inequality so that one side is 0. Then use the Intersection Point(s) feature on the calculator.

EXAMPLE 1 Radical Equation

Solve $\sqrt{x} + \sqrt{x+2} = 3$.

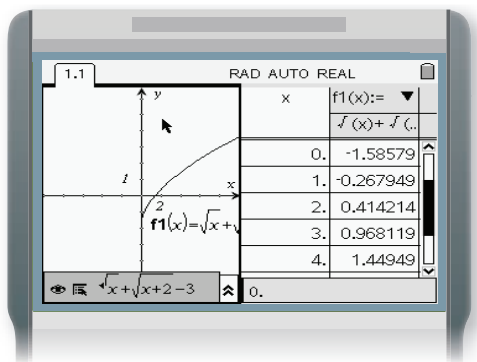
Step 1 Rewrite the equation.

- Subtract 3 from each side of the equation to get $\sqrt{x} + \sqrt{x+2} - 3 = 0$.
- Graph the function. Enter $y = \sqrt{x} + \sqrt{x+2} - 3$ for $f1(x)$.

KEYSTROKES: 6: New Document 2: Add Graphs & Geometry 2 3

Step 2 Use a table and estimate the solution.

- You can use a function table to locate intervals where the solution(s) lie.
- KEYSTROKES: 2: View 9: Add Function Table
- Observe the table and estimate the solution(s).



Since the function changes sign from negative to positive between $x = 1$ and $x = 2$, there is a solution between 1 and 2.

Step 3 Use the Intersection Point(s) feature.

Make sure the cursor is on the graph side.

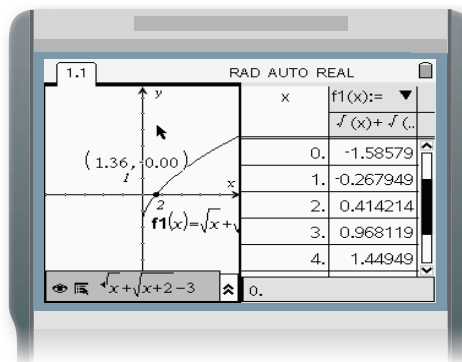
KEYSTROKES:

Find the point where the curve intersects the x -axis.

KEYSTROKES: 6: Points & Lines
3: Intersection Point(s)

Move the arrow until the x -axis is highlighted and press . Then move the arrow until $f1(x)$ is highlighted and press .

If the coordinates of the point are not displayed, then 1: Actions 7: Coordinates and Equations. Press on the point.



The solution is about 1.36. This is consistent with the estimate made by using the Function Table.

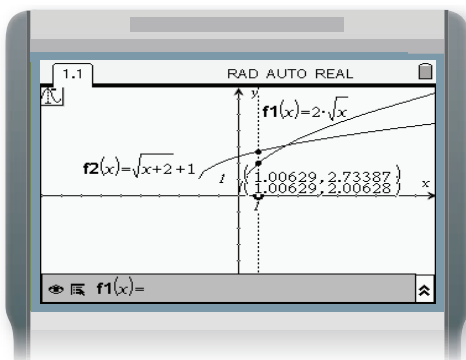
EXAMPLE 2 Radical Inequality

Solve $2\sqrt{x} > \sqrt{x+2} + 1$.

Step 1 Graph each side of the inequality and use the Trace feature.

- In a Graphs & Geometry window, enter $f1(x) = 2\sqrt{x}$ and $f2(x) = \sqrt{x+2} + 1$.

KEYSTROKES: 6: New Document 2: Add Graphs & Geometry 2 2 1



KEYSTROKES: 5: Trace 2: Trace All

Then press . This will trace both graphs at the same time.

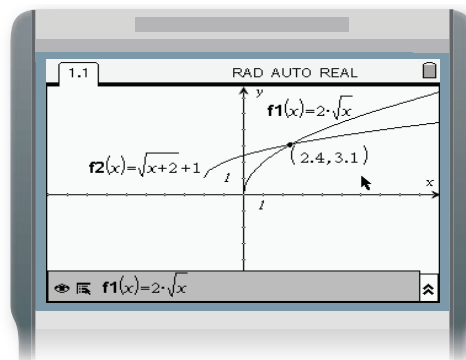
The calculator screen above shows that, for points to the left of where the curves cross, $f1(x) < f2(x)$ or $2\sqrt{x} < \sqrt{x+2} + 1$. To solve the original inequality, you must find points for which $f1(x) > f2(x)$. These are the points to the right of where the curves cross.

Step 2 Use the Intersection Point(s) feature.

- You can use the Intersection Point(s) feature to approximate the x -coordinate of the point at which the curves cross.

KEYSTROKES: 6: Points & Lines 3: Intersection Point(s)

Select each graph and press .



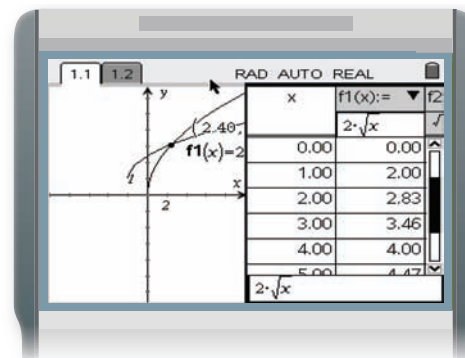
The calculator screen shows that the x -coordinate of the point at which the curves cross is about 2.40. Therefore, the solution of the inequality is about $x > 2.40$. Use the symbol $>$ in the solution because the symbol in the original inequality is $>$.

Step 3 Use the Function Table feature to check your solution.

- Insert a function table.

KEYSTROKES: 2: View 9: Add Function Table

Notice that when x is less than or equal to 2.4, $f1(x) < f2(x)$. This verifies the solution $\{x \mid x > 2.40\}$.



Exercises

Use a graphical method to solve each equation or inequality.

1. $\sqrt{x+4} = 3$

2. $\sqrt{3x-5} = 1$

3. $\sqrt{x+5} = \sqrt{3x+4}$

4. $\sqrt{x+3} + \sqrt{x-2} = 4$

5. $\sqrt{3x-7} = \sqrt{2x-2} - 1$

6. $\sqrt{x+8} - 1 = \sqrt{x+2}$

7. $\sqrt{x-3} \geq 2$

8. $\sqrt{x+3} > 2\sqrt{x}$

9. $\sqrt{x} + \sqrt{x-1} < 4$

10. **WRITING IN MATH** Explain how you could apply the technique in the first example to solving an inequality.