

# Solving Radical Equations and Inequalities

You can use a TI-73 Explorer graphing calculator to solve radical equations and inequalities. One way to do this is by rewriting the equation or inequality so that one side is 0 and then using the zero feature on the calculator.

**ACTIVITY 1** Solve  $\sqrt{x} + \sqrt{x+2} = 3$ .

**Step 1** Rewrite the equation.

- Subtract 3 from each side of the equation to obtain  $\sqrt{x} + \sqrt{x+2} - 3 = 0$ .
- Enter the function  $y = \sqrt{x} + \sqrt{x+2} - 3$  in the Y= list.

**KEYSTROKES:** Review entering a function in your textbook.

**Step 2** Use a table.

- You can use the TABLE function to locate intervals where the solution(s) lie. First, enter the starting value and the interval for the table.

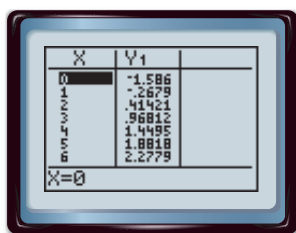
**KEYSTROKES:**  $\boxed{2nd}$   $\boxed{[TBLSET]}$   $\boxed{0}$   $\boxed{ENTER}$   
 $\boxed{1}$   $\boxed{ENTER}$



**Step 3** Estimate the solution.

- Complete the table and estimate the solution(s).

**KEYSTROKES:**  $\boxed{2nd}$   $\boxed{[TABLE]}$

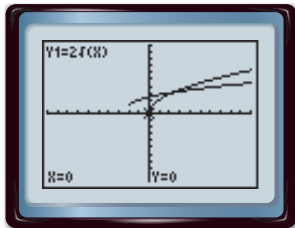


Since the function changes sign from negative to positive between  $x = 1$  and  $x = 2$ , there is a solution between 1 and 2.

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

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

- In the  $Y=$  list, enter  $y_1 = 2\sqrt{x}$  and  $y_2 = \sqrt{x+2} + 1$ . Then press **GRAPH**.



$[-10, 10]$  scl: 1 by  $[-10, 10]$  scl: 1

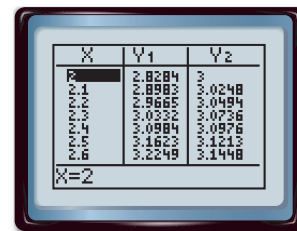
- Press **TRACE**. You can use  $\blacktriangle$  or  $\blacktriangledown$  to switch the cursor between the two curves.

The calculator screen above shows that, for points to the left of where the curves cross,  $Y_1 < Y_2$  or  $2\sqrt{x} < \sqrt{x+2} + 1$ . To solve the original inequality, you must find points for which  $Y_1 > Y_2$ . These are the points to the right of where the curves cross.

**Step 2** Use the table feature to check your solution.

Start the table at 2 and show  $x$ -values in increments of 0.1. Scroll through the table.

**KEYSTROKES:** **2nd** [TBLSET] 2 **ENTER**.1 **ENTER**  
**2nd** [TABLE]



Notice that when  $x$  is less than or equal to 2.4,  $Y_1 < Y_2$ . This verifies the solution  $\{x \mid x > 2.40\}$ .

**EXERCISES**

Solve each equation or inequality.

- $\sqrt{x+4} = 3$
- $\sqrt{3x-5} = 1$
- $\sqrt{x+5} = \sqrt{3x+4}$
- $\sqrt{x+3} + \sqrt{x-2} = 4$
- $\sqrt{3x-7} = \sqrt{2x-2} - 1$
- $\sqrt{x+8} - 1 = \sqrt{x+2}$
- $\sqrt{x-3} \geq 2$
- $\sqrt{x+3} > 2\sqrt{x}$
- $\sqrt{x} + \sqrt{x-1} < 4$
- Explain how you could apply the technique in the first example to solving an inequality.