

## Solving Rational Equations and Inequalities with Graphs and Tables

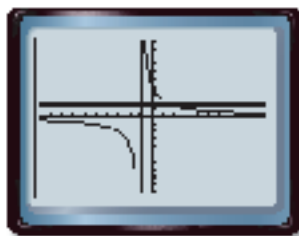
You can use a TI-73 Explorer graphing calculator to solve rational equations by graphing or by using the table feature. Graph both sides of the equation and locate the point(s) of intersection.

**ACTIVITY 1** Solve  $\frac{4}{x+1} = \frac{3}{2}$ .

**Step 1** Graph each side of the equation.

Graph each side of the equation as a separate function. Enter  $\frac{4}{x+1}$  as Y1 and  $\frac{3}{2}$  as Y2. Then graph the two equations.

KEYSTROKES:  $\boxed{Y=}$   $\boxed{4}$   $\boxed{+}$   $\boxed{(}$   $\boxed{X}$   $\boxed{+}$   $\boxed{1}$   $\boxed{)}$   
 $\boxed{ENTER}$   $\boxed{3}$   $\boxed{\div}$   $\boxed{2}$   $\boxed{ZOOM}$   $\boxed{6}$



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

Because the calculator is in connected mode, a vertical line may appear connecting the two branches of the graph. This is not part of the graph.

**Step 2** Use the table feature.

Verify the solution using the table feature. Set up the table to show x-values in increments of  $\frac{1}{3}$ .

KEYSTROKES:  $\boxed{2nd}$   $\boxed{[TBLSET]}$   $\boxed{0}$   $\boxed{ENTER}$   $\boxed{1}$   $\boxed{\div}$   $\boxed{3}$   $\boxed{ENTER}$   $\boxed{2nd}$   $\boxed{[TABLE]}$

The table displays x-values and corresponding y-values for each graph. At  $x = 1\frac{2}{3}$ , both functions have a y-value of 1.5. Thus, the solution of the equation is  $1\frac{2}{3}$ .


X	Y1	Y2
0	4	1.5
.33333	3	1.5
.66667	2.4	1.5
1	2	1.5
1.3333	1.7143	1.5
1.6667	1.5	1.5
2	1.3333	1.5

You can use a similar procedure to solve rational inequalities using a graphing calculator.

**ACTIVITY 2** Solve  $\frac{3}{x} + \frac{7}{x} > 9$ .

**Step 1** Enter the inequalities.

Rewrite the problem as a system of inequalities.

The first inequality is  $\frac{3}{x} + \frac{7}{x} > y$  or  $y < \frac{3}{x} + \frac{7}{x}$ . Since this inequality includes the less than symbol, shade below the curve. First, enter the boundary and then use the arrow and **ENTER** keys to choose the shade below icon, .

The second inequality is  $y > 9$ . Shade above the curve since this inequality contains greater than.

KEYSTROKES:   **ENTER** **ENTER** **ENTER**   3  $\div$  X,T,θ,n  $+$  7  $\div$  X,T,θ,n **ENTER**  
  **ENTER** **ENTER**   9 **GRAPH**

**Step 2** Graph the system.

KEYSTROKES: **GRAPH**



The solution set of the original inequality is the set of x-values of the points in the region where the shadings overlap. Conclude that the solution set is

$$\{x \mid 0 > x > 1\frac{1}{9}\}.$$

## EXERCISES

Solve each equation or inequality.

1.  $\frac{1}{x} + \frac{1}{2} = \frac{2}{x}$

2.  $\frac{1}{x-4} = \frac{2}{x-2}$

3.  $\frac{4}{x} = \frac{6}{x^2}$

4.  $\frac{1}{1-x} = 1 - \frac{x}{x-1}$

5.  $\frac{1}{x+4} = \frac{2}{x^2+3x-4} - \frac{1}{1-x}$

6.  $\frac{1}{x} + \frac{1}{2x} > 5$

7.  $\frac{1}{x-1} + \frac{2}{x} < 0$

8.  $1 + \frac{5}{x-1} \leq 0$

9.  $2 + \frac{1}{x-1} \geq 0$