

# Graphing Technology Lab

## Solving Rational Equations and Inequalities

Casio FX-9750G

You can use a Casio FX-9750G 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 Rational Equation

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

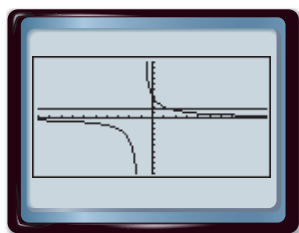
Clear the calculator memory and set the viewing window to standard.

Select MEM from the main menu;  $\blacktriangledown$  RESET [F1] MENU 5 [SHIFT] [V-Window] [F3] [EXE]

#### 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: 4  $\div$  ( [X,0,T] + 1 ) [EXE] 3  $\div$  2 [EXE] [F6]



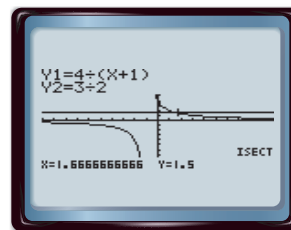
[-10, 10] scl: 1 by [-10, 10] scl: 1

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

#### Step 2 Use the ISCT feature.

The ISCT feature on the G-Solv menu allows you to approximate the ordered pair of the point at which the graphs cross.

KEYSTROKES: [SHIFT] [G-Solv] [F5]



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

The solution is  $1\frac{2}{3}$  or  $1.\bar{6}$ .

#### Step 3 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: MENU 7 [F5] (←) 3 [EXE] 3 [EXE] 1  $\div$  3 [EXE] [EXE] [F6]



The table displays  $x$ -values and corresponding  $y$ -values for each graph. At  $x = 1\frac{2}{3}$  or  $1.\bar{6}$ , both functions have a  $y$ -value of 1.5. Thus, the solution of the equation is  $1\frac{2}{3}$  or  $1.\bar{6}$ .

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

## ACTIVITY 2 Rational Inequality

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

**Step 1** Enter the inequalities.

Rewrite the problem as a system of inequalities.

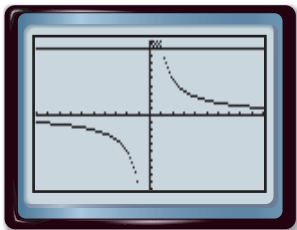
The first inequality is  $\frac{3}{x} + \frac{7}{x} > y$  or  $y < \frac{3}{x} + \frac{7}{x}$ . Since this inequality includes the *less than* symbol, shade below the curve.

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

KEYSTROKES: **MENU** 5 **F2** **F1**  $\blacktriangledown$  **F2** **F1**  $\blacktriangle$  **F3** **F6** **F2** 3  $\div$  **X,0,T**  
 $+$  7  $\div$  **X,0,T** **EXE** **F3** **F6** **F1** 9 **EXE**

**Step 2** Graph the system.

KEYSTROKE: **F6**



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

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

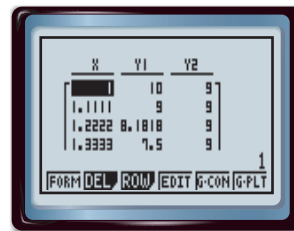
Using the calculator's **ISCT** feature, you can conclude that the solution set is  $\{x \mid 0 < x < 1\frac{1}{9}\}$ .

KEYSTROKES: **SHIFT** **[G-Solv]** **F5**

**Step 3** Use the **TABLE** feature.

Verify using the **TABLE** feature. Set up the table to show  $x$ -values in increments of  $\frac{1}{9}$ .

KEYSTROKES: **MENU** 7 **F5**  $(-)$  3 **EXE** 3 **EXE**  
 1  $\div$  9 **EXE** **EXE** **F6**



Scroll through the table. Notice that for  $x$ -values greater than 0 and less than  $1\frac{1}{9}$ ,  $Y1 > Y2$ . This confirms that the solution of the inequality is  $\{x \mid 0 < x < 1\frac{1}{9}\}$ .

## Exercises

Solve each equation or inequality.

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

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

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

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

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

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

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

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

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