



# Graphing Calculator Investigation

A Follow-Up of Lesson 9-3

Sharp EL-9900

## Graphing Rational Functions

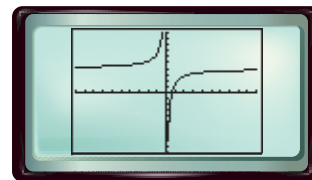
A Sharp EL-9900 graphing calculator can be used to explore the graphs of rational functions. These graphs have some features that never appear in the graphs of polynomial functions.

**Example 1** Graph  $y = \frac{8x - 5}{2x}$  in the standard viewing window. Find the equations of any asymptotes.

- Enter the equation in the Y= list.

**KEYSTROKES:**  $\boxed{Y=}$   $\boxed{(}$   $8$   $\boxed{X/\theta/T/n}$   $\boxed{-}$   $5$   $\boxed{)}$   $\boxed{\div}$   $\boxed{(}$   $2$   
 $\boxed{X/\theta/T/n}$   $\boxed{)}$   $\boxed{ENTER}$   $\boxed{ZOOM}$   $5$

By looking at the equation, we can determine that if  $x = 0$ , the function is undefined. The equation of the vertical asymptote is  $x = 0$ . Notice what happens to the  $y$  values as  $x$  grows larger and as  $x$  gets smaller. The  $y$  values approach 4. So, the equation for the horizontal asymptote is  $y = 4$ .



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

**Example 2** Graph  $y = \frac{x^2 - 16}{x + 4}$  in the window  $[-5, 5]$  by  $[-10, 2]$  with scale factors of 1.

The graph looks like a solid line, however it is not continuous. Use the TABLE feature to find the values of  $y$  for  $x$  values beginning at  $-5$ .

**KEYSTROKES:**  $\boxed{2nd F}$   $\boxed{[TBLSET]}$   $\boxed{ENTER}$   $\boxed{\blacktriangledown}$   $-5$   $\boxed{ENTER}$   $1$   $\boxed{ENTER}$   
 $\boxed{TABLE}$

X	Y1
-5	-3
-4	-7
-3	-6
-2	-5
-1	-4
0	-4

Notice there is not a  $y$  value at  $x = -4$ . This happens because the denominator is 0 when  $x = -4$ . Therefore, the function is undefined when  $x = -4$ .

**Exercises 1–6.** See pp. 519A–519D for graphs.

Use a graphing calculator to graph each function. Be sure to show a complete graph. Draw the graph on a sheet of paper. Write the  $x$ -coordinates of any points of discontinuity and/or the equations of any asymptotes.

- $f(x) = \frac{1}{x}$   $x = 0, y = 0$
- $f(x) = \frac{x}{x + 2}$
- $f(x) = \frac{2}{x - 4}$   $x = 4, y = 0$
- $f(x) = \frac{2x}{3x - 6}$
- $f(x) = \frac{4x + 2}{x - 1}$
- $f(x) = \frac{x^2 - 9}{x + 3}$  point discontinuity at  $x = -3$
- Which graph(s) has point discontinuity? **6**
- Describe functions that have point discontinuity. **See margin.**

[www.algebra2.com/other\\_calculator\\_keystrokes](http://www.algebra2.com/other_calculator_keystrokes)