Graphing Calculator Investigation

A Follow-Up of Lesson 12-2

Sharp EL-9900

Rational Expressions

When simplifying rational expressions, you can use a Sharp EL-9900 graphing calculator to support your answer. If the graphs of the original expression and the simplified expression coincide, they are equivalent. You can also use the graphs to see excluded values.

Simplify $\frac{x^2 - 25}{x^2 + 10x + 25}$.

Step 1 *Factor the numerator and denominator.*

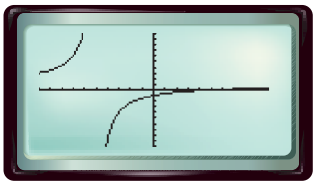
- $\frac{x^2 - 25}{x^2 + 10x + 25} = \frac{(x - 5)(x + 5)}{(x + 5)(x + 5)}$

  $= \frac{(x - 5)}{(x + 5)}$ When $x = -5$, $x + 5 = 0$. Therefore, x cannot equal -5 because you cannot divide by zero.

Step 2 *Graph the original expression.*

- Enter $\frac{x^2 - 25}{x^2 + 10x + 25}$ as Y1 and graph.

KEYSTROKES: [Y=] [(] [X/θ/T/n] [x^2] [−] 25 [)] [÷] [(] [X/θ/T/n] [x^2] [+] 10 [X/θ/T/n] [+] 25 [)] [ENTER] [ZOOM] 5

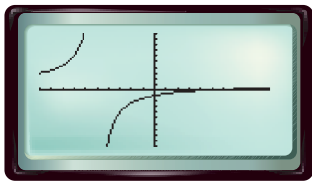


[10, 10] scl: 1 by [−10, 10] scl: 1

Step 3 *Graph the simplified expression.*

- Enter $\frac{(x - 5)}{(x + 5)}$ as Y2 and graph.

KEYSTROKES: [Y=] [▼] [(] [X/θ/T/n] [−] 5 [)] [÷] [(] [X/θ/T/n] [+] 5 [)] [ENTER] [GRAPH]



[10, 10] scl: 1 by [−10, 10] scl: 1

Since the graphs overlap, the two expressions are equivalent.

Exercises **4a. Sample answer: Examine the values and verify that they are identical.**

Simplify each expression. Then verify your answer graphically. Name the excluded values. 1–3. See margin for graphs.

1. $\frac{3x + 6}{x^2 + 7x + 10}$ $\frac{3}{x + 5}$; $-5, -2$

2. $\frac{x^2 - 9x + 8}{x^2 - 16x + 64}$ $\frac{x - 1}{x - 8}$; 8

3. $\frac{5x^2 + 10x + 5}{3x^2 + 6x + 3}$ $\frac{5}{3}$; -1

4. Simplify the rational expression $\frac{2x - 9}{4x^2 - 18x}$ and answer the following questions using the TABLE menu on your calculator.

a. How can you use the TABLE function to verify that the original expression and the simplified expression are equivalent?

b. How does the TABLE function show you that an x value is an excluded value? **It displays ERROR.**

www.algebra1.com/other_calculator_keystrokes