

## 8.4 Verify Operations with Rational Expressions

TEKS a.5, a.6, 2A.2.A, 2A.10.A

**QUESTION** How can you use a graphing calculator to verify the results of operations on rational expressions?

**EXAMPLE** Check a simplified rational expression in two ways

Simplify  $\frac{x^2 - x - 12}{x^2 - 9x + 20}$ . Then verify the result numerically and graphically.

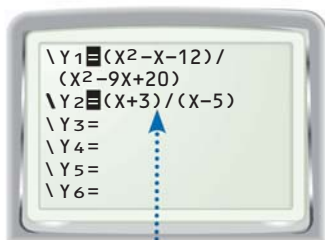
**STEP 1** Simplify expression

Simplify the rational expression by factoring the numerator and denominator, then dividing out common factors.

$$\frac{x^2 - x - 12}{x^2 - 9x + 20} = \frac{(x-4)(x+3)}{(x-4)(x-5)} = \frac{x+3}{x-5}$$

**STEP 2** Enter expressions

Enter the original expression as  $y_1$  and the simplified result as  $y_2$ . Use the *thick* graph style for  $y_2$ .



Remember to use parentheses correctly.

**STEP 3** Display table

Use the *table* feature to examine corresponding values of the two expressions.

X	Y1	Y2
1	-1	-1
2	-1.667	-1.667
3	-3	-3
4	ERROR	-7
5	ERROR	ERROR

X=1

The values of  $y_1$  and  $y_2$  are the same, except that  $y_1$  is undefined when  $x = 4$  and  $x = 5$ , and  $y_2$  is undefined only when  $x = 5$ .

**STEP 4** Display graphs

Put your calculator in *connected* mode. Display the graphs in an appropriate viewing window.



By using the *thick* graph style for  $y_2$ , you can see the graph of  $y_2$  being drawn over the graph of  $y_1$ . So, the graphs coincide.

**PRACTICE**

Simplify the expression. Verify your result numerically and graphically.

1.  $\frac{x^2 - 5x}{x^2 - 7x + 10}$

2.  $\frac{3x^2 + 6x}{x^2 - 2x - 8}$

3.  $\frac{x^2 + 5x + 4}{x^2 + x - 12}$

Perform the indicated operation and simplify. Verify your result numerically and graphically.

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

5.  $\frac{4x^2 - 8x}{5x + 15} \div \frac{x-2}{x+3}$

6.  $\frac{x^2 - 3x - 10}{x^2 + 3x + 3} \cdot \frac{x^2 + 2x - 3}{x^2 + x - 2}$