

**7.4****Adding and Subtracting Rational Expressions**

For use with Exploration 7.4

**Essential Question** How can you determine the domain of the sum or difference of two rational expressions?

**1 EXPLORATION:** Adding and Subtracting Rational Expressions

**Work with a partner.** Find the sum or difference of the two rational expressions. Then match the sum or difference with its domain. Explain your reasoning.

**Sum or Difference****Domain**

a.  $\frac{1}{x-1} + \frac{3}{x-1} =$

A. all real numbers except  $-2$ 

b.  $\frac{1}{x-1} + \frac{1}{x} =$

B. all real numbers except  $-1$  and  $1$ 

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

C. all real numbers except  $1$ 

d.  $\frac{1}{x-1} + \frac{-1}{x+1} =$

D. all real numbers except  $0$ 

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

E. all real numbers except  $-2$  and  $1$ 

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

F. all real numbers except  $0$  and  $1$ 

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

G. all real numbers except  $2$ 

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

H. all real numbers except  $0$  and  $2$

**7.4 Adding and Subtracting Rational Expressions (continued)****2 EXPLORATION: Writing a Sum or Difference**

**Work with a partner.** Write a sum or difference of rational expressions that has the given domain. Justify your answer.

- a. all real numbers except  $-1$
  
  
  
  
  
  
  
  
  
  
- b. all real numbers except  $-1$  and  $3$
  
  
  
  
  
  
  
  
  
  
- c. all real numbers except  $-1$ ,  $0$ , and  $3$

**Communicate Your Answer**

3. How can you determine the domain of the sum or difference of two rational expressions?
  
  
  
  
  
  
  
  
  
  
4. Your friend found a sum as follows. Describe and correct the error(s).

$$\frac{x}{x+4} + \frac{3}{x-4} = \frac{x+3}{2x}$$

**7.4****Notetaking with Vocabulary**

For use after Lesson 7.4

In your own words, write the meaning of each vocabulary term.

complex fraction

**Core Concepts****Adding or Subtracting with Like Denominators**Let  $a$ ,  $b$ , and  $c$  be expressions with  $c \neq 0$ .**Addition**

$$\frac{a}{c} + \frac{b}{c} = \frac{a + b}{c}$$

**Subtraction**

$$\frac{a}{c} - \frac{b}{c} = \frac{a - b}{c}$$

**Notes:****Adding or Subtracting with Unlike Denominators**Let  $a$ ,  $b$ ,  $c$ , and  $d$  be expressions with  $c \neq 0$  and  $d \neq 0$ .**Addition**

$$\frac{a}{c} + \frac{b}{d} = \frac{ad}{cd} + \frac{bc}{cd} = \frac{ad + bc}{cd}$$

**Subtraction**

$$\frac{a}{c} - \frac{b}{d} = \frac{ad}{cd} - \frac{bc}{cd} = \frac{ad - bc}{cd}$$

**Notes:**

**7.4** Notetaking with Vocabulary (continued)**Simplifying Complex Fractions**

**Method 1** If necessary, simplify the numerator and denominator by writing each as a single fraction. Then divide by multiplying the numerator by the reciprocal of the denominator.

**Method 2** Multiply the numerator and the denominator by the LCD of *every* fraction in the numerator and denominator. Then simplify.

**Notes:**

**Extra Practice**

In Exercises 1–4, find the sum or difference.

1.  $\frac{1}{x-1} - \frac{5}{x-1}$

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

3.  $\frac{6x}{x+4} + \frac{24}{x+4}$

4.  $\frac{2x^2}{x-7} - \frac{14x}{x-7}$

**7.4** Notetaking with Vocabulary (continued)

In Exercises 5–7, find the least common multiple of the expressions.

5.  $9x^3, 3x^2 - 21x$

6.  $x + 5, 2x^2 + 11x + 5$

7.  $x^2 + 5x + 6, x^2 - 3x - 18$

In Exercises 8–11, find the sum or the difference.

8.  $\frac{3}{2x} + \frac{11}{5x}$

9.  $\frac{15}{x-2} + \frac{3}{x+8}$

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

11.  $\frac{x}{x-7} - \frac{2}{x+1} - \frac{8x}{x^2-6x-7}$

In Exercises 12 and 13, simplify the complex fraction.

12.  $\frac{\frac{x}{10} - 3}{5 + \frac{1}{x}}$

13.  $\frac{\frac{12}{x^2 - 7x - 44}}{\frac{2}{x - 11} + \frac{1}{x + 4}}$