

Simplifying Rational Expressions

(Pages 638–643)

A **rational expression** is an algebraic fraction whose numerator and denominator are polynomials. Any values of the variable that result in a denominator of zero must be excluded from the domain of the variable. These are called **excluded values** of the rational expression, and can be investigated on the graph of the related **rational function**. To simplify a rational expression, factor the numerator and denominator, and then divide by the GCF.

EXAMPLES

A Find the excluded value(s) for $\frac{2x}{x(x+5)}$.

Exclude the values for which $x(x+5) = 0$.

$$x(x+5) = 0$$

$$x = 0 \text{ or } x + 5 = 0$$

$$x = -5$$

So, x cannot equal 0 or -5 .

B Simplify $\frac{b-3}{b^2-2b-3}$.

$$\frac{b-3}{b^2-2b-3} = \frac{b-3}{(b-3)(b+1)}$$

Factor the denominator.

$$= \frac{\cancel{b-3}}{\cancel{(b-3)}(b+1)}$$

Simplify the fraction by dividing by the GCF, $b-3$.

$$= \frac{1}{b+1}$$

Note that -1 and 3 are excluded values for b .

Try These Together

1. Find the excluded value(s) for $\frac{7a^3}{14a}$.

HINT: Exclude values for which $14a = 0$.

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

HINT: Factor both the numerator and the denominator.

PRACTICE

Find the excluded value(s) for each rational expression.

3. $\frac{8a}{a(a+3)}$

4. $\frac{x^2-25}{x-5}$

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

6. $\frac{a+7}{a^2+9a+14}$

Simplify each rational expression.

7. $\frac{6x^2y}{30x}$

8. $\frac{9x^4y^2z}{x^6y}$

9. $\frac{20xyz^3}{60x^2yz^3}$

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

11. $\frac{12x}{3x+6}$

12. $\frac{b^2-4}{4b-8}$

13. $\frac{x^2+6x+8}{6x+24}$

14. $\frac{y^2+7y+6}{y^2+5y-6}$



15. **Standardized Test Practice** Simplify the rational expression $\frac{2x^2-98}{8x-56}$.

A $4(x+7)$

B $4(x-7)$

C $\frac{x^2-49}{x-7}$

D $\frac{x+7}{4}$

Answers: 1. 0 2. $\frac{x-5}{2}$ 3. 0, -3 4. 5 5. -1, 1 6. -7, -2 7. $\frac{5}{xy}$ 8. $\frac{x^2}{9z}$ 9. $\frac{3x}{1}$ 10. $\frac{10-5x}{2x}$ 11. $\frac{x+2}{4x}$ 12. $\frac{b+2}{4}$ 13. $\frac{6}{x+2}$ 14. $\frac{y-1}{y+1}$ 15. D