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**Simplifying Rational Expressions**

Rational expressions may be in the form of *monomials* or *polynomials.*

Simplifying rational expressions is similar to simplifying numerical fractions where common factors are taken out.

Example: 

*Excluded values* are those that make the denominator 0. A denominator can not equal 0, so these values are not part of the solution. Consider not only the solution, but also the origin expression to figure the excluded values.



What is the simplified form of  State any excluded values.

**Solve** Monomials: reduce numbers; cancel out like variables



The simplified form is  when *a ≠* 0.

What is the simplified form of  State any excluded values.

**Solve** Polynomials: cancel out factors or groups of factors



The simplified form is *x* + 2 when *x* ≠ −2.

**Recognizing Opposite Factors**

You can find the opposite of a number by multiplying by −1. For example, the opposite of 3 is (−1)(3) = −3.

Similarly, multiplying a polynomial by −1 results in its opposite. For example, the opposite of *x* − 2 is (−1)(*x* − 2) = −*x* + 2. It can also be written as 2 − *x*.



Write the opposite of (20 − *x*) two ways.

**Solve** Multiply by (-1) to find the opposite.

(−1)(20 − *x*) = −20 + *x* or *x* − 20

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**Simplifying Rational Expressions**

**Exercises**

**Simplify each expression. State any excluded values.**

**1. ****2. ** **3. **

**4. ** **5. ** **6. **

**7.  8. **

**9.  10. **

**11.  12. **

**13.  14. **

**15.  16. **

**17. ** **18. **

**19.  20. **

**Write the opposite expression and simplify the opposite expression.**

**21.  22. **

**23.  24. **