

Sec 9-4 Simplifying Rational Expressions

- Factor all numerators and denominators
- Cancel factors common to the numerator and denominator
- Restrictions are any values that make the denominator zero at any point (beginning or end)

Simplify. State restrictions on the variable.

$$\frac{4x^4 - 36x^2}{6x^3 - 36x^2 + 54x} = \frac{4x^2(x^2 - 9)}{6x(x^2 - 6x + 9)} = \frac{2x^2(x+3)(x-3)}{3x(x-3)(x-3)}$$

$\begin{array}{c} 9 \\ -3 \quad -3 \end{array}$

$$\frac{2x(x+3)}{3(x-3)}$$

$x \neq 3, 0$

Simplify each.

$$1. \frac{16}{9} \cdot \frac{25}{24} = \frac{10}{27} \quad 2. \frac{-48}{36} \cdot \frac{28}{-35} = \frac{16}{15}$$

$-\frac{4}{3} \cdot \frac{4}{-5} = \frac{16}{15}$

$$3. \frac{8}{15} \div \frac{44}{21} \quad \text{Instead of dividing by a fraction we multiply by the reciprocal.}$$

$$\frac{8}{15} \cdot \frac{21}{44} = \frac{14}{55}$$

Sec 9-4 Simplifying the Product or Quotient of Rational Expressions

- Factor all numerators and denominators
- If multiplying rational expressions you can cross cancel
- If dividing rational expressions, change to multiplying by the reciprocal so you can cross cancel.
- State restrictions on the variable.

Simplify. State the restrictions on the variables.

$$\frac{8x^4 + 2x^3}{6x^2 - 24x} \cdot \frac{x^2 + x - 6}{4x^2 + 13x + 3}$$

Handwritten work shows the following steps:

- Factorization of the first fraction: $\frac{2x^3(4x+1)}{6x(x-4)}$ (Note: $4x+1$ is crossed out, and $4x$ is written below).
- Factorization of the second fraction: $\frac{(x+3)(x-2)}{(x+3)(x+1)}$ (Note: $x+3$ and $4x+1$ are crossed out).
- Restriction diagram for the second fraction:

-6	-2
+3	1
- Final simplified expression: $\frac{x^2(x-2)}{3(x-4)}$ (circled in red).
- Restrictions: $x \neq 0, 4, -3, -\frac{1}{4}$ (written in red).

Simplify. State the restrictions on the variables.

$$\frac{x^2 - 16}{9x^2 + 18x} \div \frac{x^2 - 3x - 4}{3x^2 + 6x}$$

Handwritten work shows the following steps:

- Factorization of the first fraction: $\frac{(x+4)(x-4)}{3x(x+2)}$ (Note: $x-4$ and $3x$ are crossed out).
- Factorization of the second fraction: $\frac{(x-4)(x+1)}{3x(x+1)}$ (Note: $x-4$ and $3x$ are crossed out).
- Restriction diagram for the second fraction:

-4	+1
-4	-3
- Final simplified expression: $\frac{(x+4)}{3(x+1)}$ (circled in red).
- Restrictions: $x \neq -1, 4, -2, 0$ (written in red).