

# U1D3\_T Simplifying Rational Expressions and Stating Restrictions

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U1D3\_T  
Simplifyin...

U1D3 Warm-Up: Factor.

$$\begin{aligned} \text{a) } & 4a^2bc + 20ab^2c - 14abc^2 \\ & = 2abc(2a + 10b - 7c) \end{aligned}$$

Greatest Common  
Factor  
GCF  $2abc$

$$\begin{aligned} \text{b) } & 6x^2 + 7x - 20 \\ & = (2x + 5)(3x - 4) \end{aligned}$$

M -120  
A 7  
+15, -8  
+5, -4

$$\begin{aligned} \text{c) } & 2x^3 - 50x \\ & = 2x(x^2 - 25) \\ & = 2x(x - 5)(x + 5) \end{aligned}$$

## MCR 3UI Simplifying Rational Expressions and Stating Restrictions

What is a Rational Expression?

An expression written with polynomials -  
in the numerator and/or denominator (like a fraction,  
only with variables !)

What is a Restriction?

The value for the variable where the  
expression cannot be defined (whatever value makes the  
denominator zero ).

### Steps to Simplifying Rational Expressions

1. Factor the numerator and denominator.
2. Divide out any factors that are common to both the numerator and the denominator.
3. Simplify the remaining polynomials.
4. Determine and state the restrictions on each variable.

Examples: Simplify each of the following rational expressions and state the restrictions on the variable.

a)  $\frac{6x^5y^3}{24x^2y}$  ← restrictions  
 $= \frac{x^3y^2}{4}$   
 OR  $\frac{1}{4}x^3y^2$   
 $x \neq 0,$   
 $y \neq 0$

b)  $\frac{4t^2+8t}{4t}$  ← C.F.  
 $= \frac{4t(t+2)}{4t}$   
 $= t+2, t \neq 0$

c)  $\frac{3-2x}{4x-6}$   
 $= \frac{-(2x-3)}{2(2x-3)}$   
 $= -\frac{1}{2}$   
restrictions  
 $2(2x-3) \neq 0$   
 $2 \neq 0$   $2x-3 \neq 0$   
 $2x \neq 3$   
 $x \neq \frac{3}{2}$

d)  $\frac{8x^3+4x^2}{6x^2+3x}$   
 $= \frac{4x^2(2x+1)}{3x(2x+1)}$   
 $= \frac{4}{3}x$  OR  $\frac{4x}{3}$   
 $3x(2x+1) \neq 0$   
 $x \neq 0, 2x+1 \neq 0$   
 $x \neq -\frac{1}{2}$

$$\begin{aligned}
 \text{e) } & \frac{5x^2+3x-2}{4x^2+x-3} \\
 & = \frac{(x+1)(5x-2)}{(4x-3)(x+1)} \\
 & = \frac{5x-2}{4x-3}, x \neq \frac{3}{4}, -1
 \end{aligned}$$

$$\begin{aligned}
 & \begin{array}{r} 1 \ 1 \ 2 \\ 3 \ 1 \ 2 \ 1 \end{array} \\
 & \begin{array}{r} 4 \ 2 \ 1 \ 3 \\ 1 \ 2 \ 3 \ 1 \end{array}
 \end{aligned}$$

$$\begin{aligned}
 & 3x^2+15xy-2xy-10y^2 \\
 & = 3x(x+5y)-2y(x+5y) \\
 & = (3x-2y)(x+5y) \\
 \text{f) } & \frac{9x^2-4y^2}{3x^2+13xy-10y^2} \\
 & = \frac{(3x-2y)(3x+2y)}{(3x-2y)(x+5y)} \\
 & = \frac{3x+2y}{x+5y}, x \neq \frac{2y}{3}, -5y
 \end{aligned}$$

$$\begin{array}{r} M-30 \\ A \ 13 \\ 15, -2 \end{array}$$

U1D3 HW: Pgs. 40-41 #1adh, 2bdfh, 3bdfh, 4bdfh, 5bd, 6ij, 8ce pg. 43 #15