Rational Functions and Equations

Complex Fractions

What is a complex rational expression?

A **complex rational expression** is a rational expression that has a rational expression in the numerator and/or denominator.

Examples:

$$\frac{2x+\frac{1}{x}}{3x-2}, \quad \frac{\frac{x+1}{x-2}}{\frac{2}{x}+\frac{3}{x^2}}, \quad \frac{\frac{y}{2}}{\frac{x-2}{3x}}$$

Simplifying Complex Fractions

1) Find the LCD of all rational expressions *within* the complex rational expression.
2) Multiply both the numerator and denominator by the LCD.
3) Distribute and simplify so that the numerator and the denominator of the complex rational expression are polynomials.
4) Simplify the resulting rational expression.

Simplify the following complex numerical fractions.

$$\frac{\frac{4}{11}}{3}$$

$$\frac{\frac{3}{5}}{12}$$

$$\frac{\frac{4}{3}}{\frac{2}{7}}$$

$$\frac{\frac{1}{10}}{\frac{1}{2}-\frac{2}{5}}$$

Simplify each expression.

$$\frac{\frac{4p+1}{p}}{\frac{p-2}{p}}$$

$$\frac{\frac{z}{(z-2)^2}}{\frac{2z}{z^2-4}}$$

Simplify each expression.

$$\frac{2+\frac{1}{x}}{2x+1}$$

$$\frac{5}{\frac{3}{x}+\frac{4}{x+1}}$$

Simplify.

$$\frac{2+\dfrac{1}{t+3}}{\dfrac{1}{t+3}+\dfrac{1}{4}}$$

Simplify.

$$\frac{\frac{1}{x-3}+\frac{1}{x+3}}{2-\frac{4}{x-3}}$$

Simplify.

$$\frac{\dfrac{y+4}{y^2-4}+1}{\dfrac{3}{y+2}-\dfrac{2}{y-2}}$$

Simplify.

$$\frac{\frac{ab^2}{2c}}{\frac{a}{4bc}}$$

Simplify.

$$\frac{\frac{1}{x}+\frac{1}{y}}{\frac{x^2-y^2}{xy}}$$