

Complex Rational Expressions

Complex rational expressions are expressions that have rational expressions in their numerators and/or denominators.

ex:

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

We'll look at two ways to simplify complex rational expressions...

Way #1: Simplify Top/Bottom, Then Divide

Ex 1.

Simplify:

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

Way #2: Multiply by $\frac{\text{LCD}}{\text{LCD}}$

Ex 2.

Simplify:

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

Ex 3.

Simplify:

$$\frac{\frac{1}{x+7} - \frac{1}{x}}{7}$$

Ex 4.

Simplify:

$$\frac{\frac{1}{2x+6} + \frac{3}{2}}{\frac{3}{x^2-9} + \frac{x}{x-3}}$$

Note: What if you see negative exponents? Write them as fractions:

$$\frac{1 - 4x^{-2}}{1 - 7x^{-1} + 10x^{-2}} = \frac{1 - \frac{4}{x^2}}{1 - \frac{7}{x} + \frac{10}{x^2}} = \dots$$

Practice

1. Simplify:

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

2. Simplify:

$$\frac{\frac{1}{x+6} - \frac{1}{x}}{6}$$

3. Simplify:

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

4. Simplify:

$$\frac{\frac{7x}{2x-2} + \frac{x}{x^2-1}}{\frac{4}{x+1} - \frac{1}{3x+3}}$$

5. Simplify:

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

Q: What is the word that everybody always says wrong?