

## 6.3 - Complex Rational Expressions

Note Title

A complex rational expression contains \_\_\_\_\_ within its numerator and/or denominator.

We will use 2 different methods for simplifying,  
DO NOT mix the methods.

① Simplify

$$a) \frac{\frac{2}{r} - \frac{3}{t}}{\frac{4}{r} - \frac{5}{t}}$$

$$b) \frac{\frac{1}{a^3b} + \frac{1}{b}}{\frac{1}{a^2b^2} - \frac{1}{b^2}}$$

### Using Multiplication by 1 to Simplify a Complex Rational Expression

1. Find the LCD of all rational expressions *within* the complex rational expression.
2. Multiply the complex rational expression by 1, writing 1 as the LCD divided by itself.
3. Distribute and simplify so that the numerator and the denominator of the complex rational expression are polynomials.
4. Factor and, if possible, simplify.

② Simplify

$$a) \frac{\frac{3}{a^2-9} + \frac{2}{a+3}}{\frac{4}{a^2-9} + \frac{1}{a+3}}$$

$$b) \frac{\frac{3x}{y} - x}{2y - \frac{y}{x}}$$

### Using Division to Simplify a Complex Rational Expression

1. Add or subtract, as necessary, to get one rational expression in the numerator.
2. Add or subtract, as necessary, to get one rational expression in the denominator.
3. Perform the indicated division (invert the divisor and multiply).
4. Simplify, if possible, by removing any factors that equal 1.

③ Simplify

$$a) \frac{\frac{3x}{y} - x}{2y - \frac{y}{x}}$$

$$b) \frac{\frac{x^2 - x - 12}{x^2 - 2x - 15}}{\frac{x^2 + 8x + 12}{x^2 - 5x - 14}}$$

$$c) \frac{a^{-1} + b^{-1}}{\frac{a^2 - b^2}{ab}}$$

$$d) \frac{\frac{y}{y^2 - 1} - \frac{3y}{y^2 + 5y + 4}}{\frac{3y}{y^2 - 1} - \frac{y}{y^2 - 4y + 3}}$$