

# **Rational Expressions - Add, Subtract, Complex Fractions Video Lecture**

**Sections 7.3, 7.4, and 7.7**

**Course Learning Objective:**

**Demonstrate appropriate manipulation of rational expressions.**

**Weekly Learning Objectives:**

- 1) Add and subtract rational expressions.**
- 2) Write a rational expression as an equivalent expression with a different denominator.**
- 3) Simplify complex fractions by multiplying by a common denominator.**
- 4) Simplify expressions with negative exponents.**
- 5) Find a simplified difference quotient.**

# Rational Expressions - Addition, Subtraction and Complex Fractions

How to add and subtract rational expressions:

- 1) Completely factor each denominator
- 2) Find the lowest common denominator (LCD) by writing each factor the greatest number of times that it appears in any given denominator.
- 3) Change each fraction to a fraction with the new LCD by multiplying top and bottom by missing factors
- 4) Add or subtract new numerators and place over LCD
- 5) Simplify numerator
- 6) Factor to reduce, if possible

Add or subtract:

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

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

$$\frac{5x}{x+3} + \frac{x+2}{x} - \frac{6}{x^2+3x}$$

$$\frac{5t+3}{2-t} + \frac{1-5t}{t-2}$$

$$\frac{2}{3x-21} + \frac{x}{49-x^2}$$

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

How to simplify a complex fraction:

- 1) Find the LCD of all fractions within the main fraction
- 2) Multiply the top and bottom of the main fraction by the LCD
- 3) Simplify and the fraction should no longer be complex
- 4) Factor to reduce, if possible

Simplify:

$$\frac{\frac{y+3}{y} - \frac{4}{y-1}}{\frac{y}{y-1} + \frac{1}{y}}$$

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

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

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

Find the difference quotient  $\frac{f(a+h) - f(a)}{h}$  for  
 $f(x) = \frac{4}{x}$

