

## 8-3 Day 2: Adding and Subtracting Rational Expressions

You can continue from yesterday's notes



Goal: Same goal as yesterday

$$(4x) \frac{x+1}{3x} + \left( \frac{2x+7}{4x^2} \right) 3$$

$$\frac{4x^2+4x}{12x^2} + \frac{6x+21}{12x^2} = \frac{4x^2+10x+21}{12x^2}$$

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↑ Add or subtract.

↓ Identify any x-values for which the expression is undefined.

$$\frac{6x+5}{x^2-3} + \frac{3x-1}{x^2-3} = \frac{9x+4}{x^2-3}$$

$$x^2 - 3 = 0 \quad x \neq \pm\sqrt{3}$$

$$\begin{matrix} +3 & +3 \\ \sqrt{x^2} & = \sqrt{3} \end{matrix}$$

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What do we do with the subtraction sign?

Add or subtract.  
Identify any x-values for which the expression is undefined.

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

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

$$x \neq \frac{1}{3}$$

$$3x - 1 = 0$$

$$+1 \quad +1$$

$$3x = 1$$

$$\frac{3x}{3} = \frac{1}{3}$$

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To add or subtract rational expressions with unlike denominators, first find the least common denominator (LCD). The LCD is the least common multiple of the polynomials in the denominators.

### Least Common Multiple (LCM) of Polynomials

To find the LCM of polynomials:

1. Factor each polynomial completely. Write any repeated factors as powers. For example,  $x^3 + 6x^2 + 9x = x(x + 3)^2$ .
2. List the different factors. If the polynomials have common factors, use the highest power of each common factor.

If these  
were fractions  
what common  
denominator  
would you make  
them?

Find the least common multiple for each pair.

$$4: 4, 8, 12, 16, 20, 24, \dots$$

$$6: 6, 12, 18, 24, \dots$$

$$4x^2y^3 \text{ and } 6x^4y^5$$

$$12x^4y^5$$

$$x^2 - 2x - 3 \text{ and } x^2 - x - 6$$

$$(x-3)(x+1)$$

$$(x-3)(x+2)$$

$$(x-3)(x+1)(x+2)$$

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Add. Identify any x-values for which the expression is undefined.

1. Factor Denominators

$$\frac{3 \cdot 3x}{2x-2} + \frac{2(3x-2)}{3x-3}$$

2. Excluded Values

$$\frac{3 \cdot 2(x-1)}{2(x-1)} + \frac{2 \cdot 3(x-1)}{3(x-1)}$$

$$x \neq 1$$

3. Find Common  
Denominators

4. Add or Subtract

$$\frac{9x}{6(x-1)} + \frac{6x-4}{6(x-1)}$$

$$= \frac{15x-4}{6(x-1)}$$

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Add. Identify any x-values for which the expression is undefined.

$$(x+3)^{-1} \quad (x+3)^2$$

1. Factor Denominators

$$\frac{\cancel{(x+3)}^x}{(x+3)x+3} + \frac{2x+6}{(x+3)(x+3)}$$

$$x \neq -3$$

2. Excluded Values

3. Find Common Denominators

$$\frac{x^2+3x}{(x+3)(x+3)} + \frac{2x+6}{(x+3)(x+3)}$$

4. Add or Subtract

$$\frac{\cancel{(x+3)}(x+2)}{\cancel{(x+3)}(x+3)} = \frac{x+2}{x+3}$$

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Subtract. Identify any x-values for which the expression is undefined.

1. Factor Denominators

$$\frac{\cancel{(5x-2)}^3x-2}{\cancel{(5x-2)}^2x+5} - \frac{2(2x+5)}{\cancel{(5x-2)}^2(2x+5)}$$

$$5x-2=0$$

$$x \neq \frac{2}{5}$$

2. Excluded Values

3. Find Common Denominators

$$\frac{15x^2-16x+4}{(5x-2)(2x+5)} - \frac{4x+10}{(5x-2)(2x+5)}$$

$$2x+5=0$$

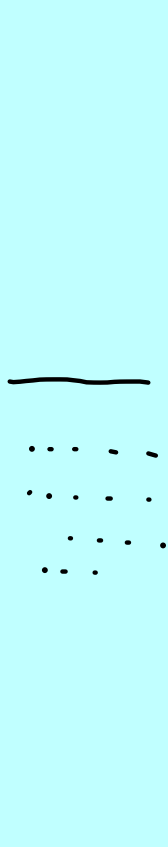
$$x \neq -\frac{5}{2}$$

4. Add or Subtract

$$\frac{15x^2-20x-6}{(5x-2)(2x+5)}$$

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Subtract. Identify any x-values for which the expression is undefined.



$$\frac{2x^2 + 64}{x^2 - 64} - \frac{(x-4)(x-8)}{x+8}$$

$X \neq -8$   
 $X \neq 8$

$$\frac{2x^2 + 64}{(x+8)(x-8)} + \frac{-x^2 + 12x - 32}{(x+8)(x-8)} = \frac{x^2 + 12x + 32}{(x+8)(x-8)}$$

$$\frac{x+4}{x-8}$$

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# Assignment:

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$$\textcircled{7} \frac{(3x-2)}{(x+6)} + \frac{(2x-3)}{(2x-1)} \quad \textcircled{8} \frac{4x-5}{4(3x+1)} + \frac{3x-1}{3x+1}$$

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$$(x+6)(2x-1)$$

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