## Concept

<u>Rational Equation</u>: an equation that involves at least one rational expression (the variable is in at least one denominator).

Examples
$$\frac{4}{5x} - \frac{2}{7} = \frac{1}{x} \qquad \frac{3x}{x+1} = \frac{2}{x-2} + \frac{x-4}{x^2 - x - 2} \qquad \frac{5}{x^2 - 49} = \frac{x+2}{x-7}$$

Non-Examples 
$$\frac{4}{x+5} - \frac{2}{7x} + \frac{1}{x}$$
 (no equal sign)

$$\frac{3x}{2} = \frac{x+2}{3} + \frac{x-4}{5}$$
 (no variable in the denominator)

## Concept

Rational equations can have <u>extraneous solutions</u>: solutions that <u>are</u> <u>excluded values of the expressions in the equation</u>. For a rational equation, <u>extraneous solutions are values that create a 0 in one or more denominator, making that expression undefined</u>. Extraneous solutions are not included in the final solution set.

For  $\frac{4}{5x} - \frac{2}{7} = \frac{1}{x}$ , a solution of 0 would be extraneous and would not be included in the final solution set.

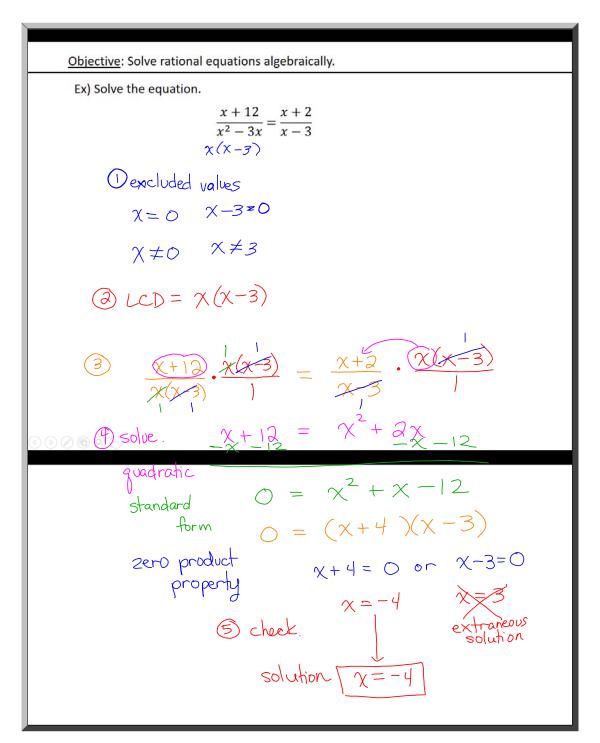
For  $\frac{3x}{x+1} = \frac{2}{x-2} + \frac{x-4}{x^2-x-2}$ , a solution of -1 or 2 would be extraneous and would not be included in the final solution set.

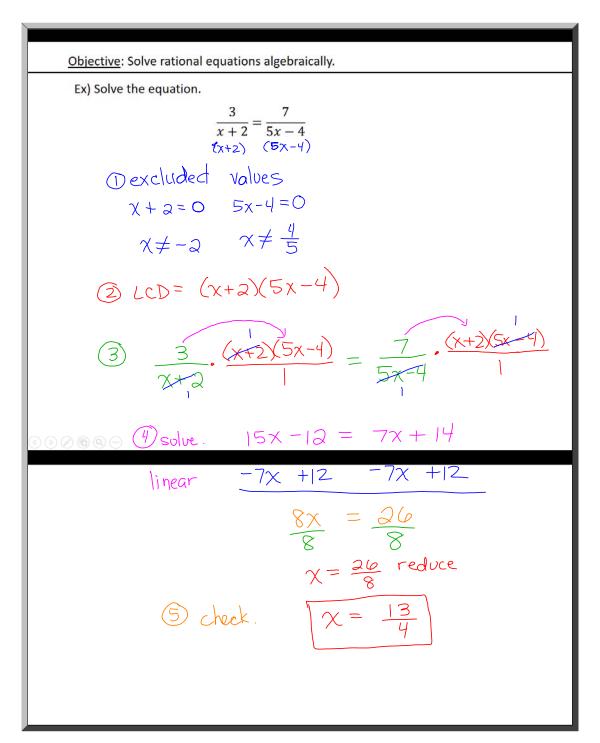


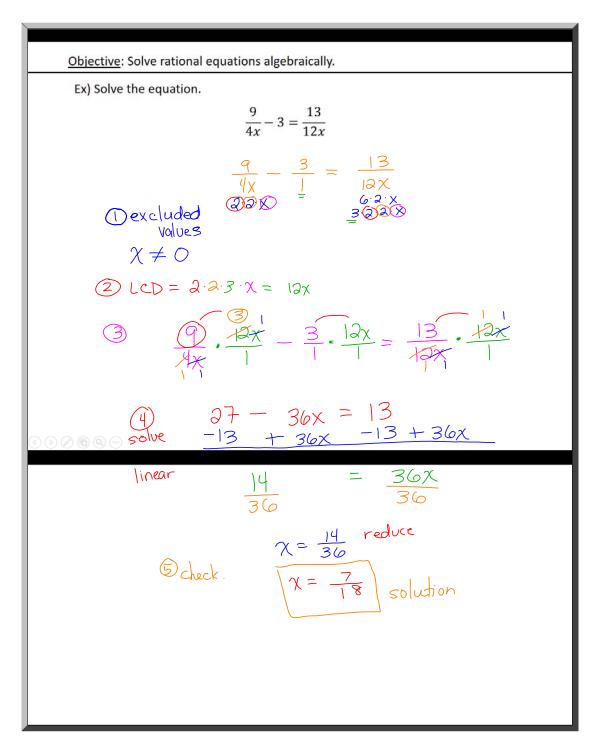
## Steps to Solve a Rational Equation

- 1. Find the LCD (lowest common denominator).
- 2. Multiply <u>every</u> term by the LCD to clear the denominators (use the multiplication property of equality).
- 3. Solve the resulting equation.
- 4. Check for <u>Extraneous Solutions</u> (excluded values; solutions that make the denominator equal to 0).
- 5. State the final solution set.









Ex) Solve the equation.

$$\frac{2}{5x} = \frac{4}{10x}$$
The excluded values  $5.0 \times 5.2.7$ 

$$\chi \neq 0$$

(2) 
$$LcD = 5.2.\chi = 10x$$

$$\frac{2}{5x} \cdot \frac{10x}{1} = \frac{4}{10x} \cdot \frac{10x}{1}$$

4 = 4 = or identity statement

infinitely many solutions

Ex) Solve the equation.

$$\frac{1}{4x} = \frac{3}{7x}$$

$$\frac{4}{4x} = \frac{3}{7x}$$

 $\frac{1}{4x} = \frac{3}{7x}$ The excluded value value

$$\chi \neq 0$$

$$3) \frac{1}{4x} \cdot \frac{3}{3} \cdot$$

7 + 12 False statement

no solution or

Objective: Solve rational equations algebraically. Closure What is an extraneous solution? An extraneous solution is a solution that is a value of the variable that makes one or more denominators in the original equation equal to 0.