

Here are the steps required for Solving Rational Equations:

- Step 1:** Eliminate all fractions. When solving rational equations, you have a choice of two ways to eliminate the fractions. Option 1; multiply the entire problem by the least common denominator or LCD. Option 2; you can cross multiply. Option 1 will work for any problem, but you can only cross multiply if you have one fraction equal to one fraction, that is, if the fractions are proportional. Note that when solving rational equations all fractions should disappear after the first step.
- Step 2:** Simplify the resulting equation. To simplify the equation you may need to distribute and combine like terms.
- Step 3:** Solve the simplified equation. If the simplified equation has any higher powers such as x^2 or x^3 , you can solve the equation by getting it equal to zero and factoring. If the simplified problem does not contain any higher powers, then solve for x by getting the x 's on one side and the numbers on the other.
- Step 4:** Check each solution. Substitute each solution into the denominator of the original question and reject any solutions that cause the denominator to equal zero because this makes the problem undefined. This step does not guarantee that the answer is correct; it only guarantees that the answer is acceptable.

Example 1 – Solve: $\frac{5}{2x} - \frac{3}{4x^2} = \frac{2}{3x}$

Step 1: Eliminate all fractions. In this case, we need to multiply by the LCD to eliminate the fractions.	$12x^2 \left(\frac{5}{2x} - \frac{3}{4x^2} = \frac{2}{3x} \right)$
Step 2: Simplify the resulting equation. To simplify the equation you may need to distribute and combine like terms.	$\begin{aligned} 5(6x) - 3(3) &= 2(4x) \\ 30x - 9 &= 8x \end{aligned}$
Step 3: Solve the simplified equation. In this case, we need to get the x 's on one side and the numbers of the other side.	$\begin{aligned} 22x &= 9 \\ x &= \frac{9}{22} \end{aligned}$
Step 4: Check each solution. In this case, the only number that would make the problem undefined is 0. Since our answer is not 0, the answer is accepted.	$x = \frac{22}{9}$

Example 2 – Solve: $\frac{5}{x+3} + \frac{2}{x^2-9} = \frac{4}{x-3}$

<p>Step 1: Eliminate all fractions. In this case, we need to multiply by the LCD to eliminate the fractions.</p>	$(x+3)(x-3)\left(\frac{5}{x+3} + \frac{2}{(x+3)(x-3)} = \frac{4}{x-3}\right)$
<p>Step 2: Simplify the resulting equation. To simplify the equation you may need to distribute and combine like terms.</p>	$\begin{aligned} 5(x-3) + 2 &= 4(x+3) \\ 5x - 15 + 2 &= 4x + 12 \\ 5x - 13 &= 4x + 12 \end{aligned}$
<p>Step 3: Solve the simplified equation. In this case, we need to get the x's on one side and the numbers of the other side.</p>	$\begin{aligned} 5x - 4x &= 12 + 13 \\ x &= 25 \end{aligned}$
<p>Step 4: Check each solution. In this case, the only numbers that would make the problem undefined are 3 or -3. Since our answer is not 3 or -3, the answer is accepted.</p>	$x = 25$

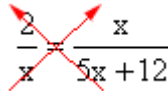
Example 3 – $\frac{x+3}{x-2} = \frac{x+4}{x-5}$

<p>Step 1: Eliminate all fractions. In this case, we can either multiply by the LCD or cross multiply to eliminate the fractions.</p>	
<p>Step 2: Simplify the resulting equation. To simplify the equation you may need to distribute and combine like terms.</p>	$\begin{aligned} (x+3)(x-5) &= (x+4)(x-2) \\ x^2 - 5x + 3x - 15 &= x^2 - 2x + 4x - 8 \\ x^2 - 2x - 15 &= x^2 + 2x - 8 \end{aligned}$
<p>Step 3: Solve the simplified equation. In this case, we need to get the x's on one side and the numbers of the other side because the x² terms will cancel out.</p>	$\begin{aligned} -2x - 2x &= -8 + 15 \\ -4x &= 7 \\ x &= -\frac{7}{4} \end{aligned}$
<p>Step 4: Check each solution. In this case, the only numbers that would make the problem undefined are 2 or 5. Since our answer is not 2 or 5, the answer is accepted.</p>	$x = -\frac{7}{4}$

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

<p>Step 1: Eliminate all fractions. In this case, we need to multiply by the LCD to eliminate the fractions.</p>	$(x-1)(x-4)\left(\frac{3}{x-1} - \frac{2}{x-4} = \frac{-6}{(x-1)(x-4)}\right)$
<p>Step 2: Simplify the resulting equation. To simplify the equation you may need to distribute and combine like terms.</p>	$\begin{aligned} 3(x-4) - 2(x-1) &= -6 \\ 3x - 12 - 2x + 2 &= -6 \\ x - 10 &= -6 \end{aligned}$
<p>Step 3: Solve the simplified equation. In this case, we need to get the x's on one side and the numbers of the other side.</p>	$\begin{aligned} x &= -6 + 10 \\ x &= 4 \end{aligned}$
<p>Step 4: Check each solution. In this case, the only numbers that would make the problem undefined are 1 or 4. Since our answer is 4, the answer is not accepted, which means:</p>	<p style="text-align: center;">No Solution</p>

Example 5 – $\frac{2}{x} = \frac{x}{5x+12}$

<p>Step 1: Eliminate all fractions. In this case, we can either multiply by the LCD or cross multiply to eliminate the fractions.</p>	
<p>Step 2: Simplify the resulting equation. To simplify the equation you may need to distribute and combine like terms.</p>	$\begin{aligned} 2(5x+12) &= x(x) \\ 10x+24 &= x^2 \end{aligned}$
<p>Step 3: Solve the simplified equation. In this case, we need to get the equation equal to zero and solve by factoring.</p>	$\begin{aligned} 0 &= x^2 - 10x - 24 \\ 0 &= (x+2)(x-12) \\ x+2=0 \text{ or } x-12=0 \\ x &= -2 \text{ or } x=12 \end{aligned}$
<p>Step 4: Check each solution. In this case, the only numbers that would make the problem undefined are 0 or $-12/5$. Since our answers are not 0 or $-12/5$, the answers are accepted.</p>	$x = -2 \text{ or } x = 12$

Example 6 – $\frac{x}{x^2 + x - 2} = \frac{x}{x^2 + 3x + 2} - \frac{x}{x^2 - 1}$

Step 1: Eliminate all fractions. In this case, we need to multiply by the LCD to eliminate the fractions.

$$(x-1)(x+2)(x+1) \left(\frac{x}{(x-1)(x+2)} = \frac{x}{(x+1)(x+2)} - \frac{x}{(x+1)(x-1)} \right)$$

Step 2: Simplify the resulting equation. To simplify the equation you may need to distribute and combine like terms.

$$\begin{aligned} x(x+1) &= x(x-1) - x(x+2) \\ x^2 + x &= x^2 - x - x^2 - 2x \\ x^2 + x &= -3x \end{aligned}$$

Step 3: Solve the simplified equation. In this case, we need to get the equation equal to zero and solve by factoring.

$$\begin{aligned} x^2 + 4x &= 0 \\ x(x+4) &= 0 \\ x = 0 \text{ or } x + 4 &= 0 \\ x = 0 \text{ or } x &= -4 \end{aligned}$$

Step 4: Check each solution. In this case, the only numbers that would make the problem undefined are 1, -1 or -2. Since our answers are not 1, -1, or -2, the answers are accepted.

$$x = 0 \text{ or } x = -4$$