

Section 4.5 - Solving Rational Equations

Rational Equation

- an equation that contains at least one rational expression.

For example: $x = \frac{x-3}{x+1}$ and $\frac{x}{4} - \frac{7}{x} = 3$

To Solve a Rational Equation:

1. Factor each denominator
2. Identify the non - permissible values
3. **Method 1:** Multiply both sides of the equation by the LCD
OR
Method 2: Add/Subtract fractions by obtaining LCD to get a single fraction on both sides of the equation and then equate numerators.
4. Solve the resulting linear or quadratic equation
5. Check your answers for **extraneous** roots

Example 1:

Solve: $\frac{x}{4} - \frac{7}{x} = 3$

Note:

Non - permissible values are identified from the original equation.



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Example 2: (ex. 2, p. 254)

Solve for x:

$$\frac{18}{x^2 - 3x} = \frac{6}{x - 3} - \frac{5}{x}$$

Example 4:

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



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Besides factoring, we may have to use the Quadratic Formula to solve for the variable in a trinomial.

Recall:

Quadratic Formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Example 3:

Solve for x: $3x^2 + 4x - 6 = 0$

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Your Turn:

1. Solve for x: $\frac{2}{a+2} - \frac{a^2+4}{a^2-4} = \frac{a}{2-a}$

Practice Questions:

p. 258, Section 4.5 Worksheet



Part 2: Word Problems

Example 1:

The sum of a number and its reciprocal is $\frac{5}{2}$. Determine the number.

Example 2:

One positive integer is 5 more than the other. When the reciprocal of the larger number is subtracted from the reciprocal of the smaller the result is $\frac{5}{14}$. Find the two integers.



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Example 3:

Sherry can mow a lawn in 5 hours. Terry can mow the same lawn in 4 hours. Determine how long it would take to mow the lawn if Sherry and Terry worked together.

	Time to mow lawn	Fraction of lawn mowed in 1 hour
Sherry		
Terry		
Together		



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Example 4:

Gerard takes 5 hours longer than Hubert to assemble a play set. If Gerard and Hubert worked together, they could assemble the play set in 6 hours. Determine how long it takes each person to assemble the play set if they worked alone.

	Time	Fraction of time in 1 hour
Gerard		
Hubert		
Together		



Example 5:

A skiing club is going on a skiing trip that costs \$1500 total for bussing. If 10 non-members are allowed to go, the price per person drops by \$5. If x represents the number of members and the situation is modelled by

$$\frac{1500}{x} - \frac{1500}{x+10} = 5$$

algebraically determine how many members there are.



Example 6:

Priddle Inc. is having a Christmas party for all of its employees. Initially, all employees agree to attend. The cost of the catering is \$1800, which is to be divided amongst all people who attend the party. At the last minute, 30 people decide not to come, increasing the cost per person by \$2. If x represents the number of employees and the situation is modelled by

$$\frac{1800}{x-30} - \frac{1800}{x} = 2$$

algebraically determine the number of people who are employed at Priddle Inc.

Practice Questions:

p. 259, #10,11,12 + Worksheet