2.4 Solving Rational Equations Notes

Sometimes you can solve a problem using a proportion—an equation involving two rational expressions set equal to each other.

Essential Understanding To solve an equation containing rational expressions, first multiply each side by the least common denominator of the rational expressions. Doing this, however, can introduce extraneous solutions.

A **rational equation** contains at least one rational expression. You can simplify solving a rational equation if you first clear the equation of denominators. You can do this by multiplying by the LCD of the rational expressions in the equation.

Rational Equation	Not a Rational Equation
$\frac{x}{x+1} + \frac{x}{x-1} = \frac{2}{x^2-1}$	$x + \frac{1}{2} = \frac{2}{3}$

Any time you multiply each side of an equation by an algebraic expression, it is possible to introduce an extraneous solution. Recall that an extraneous solution is a solution of the derived equation, but not a solution of the original equation. You must check all solutions in the original equation to confirm that they are indeed solutions.

Problem 1 Solving a Rational Equation

Got It? What are the solutions of the rational equation?

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

b. $\frac{x}{x+1} + \frac{3}{x+4} = \frac{x+3}{x+4}$

Practice Solve each equation. Check each solution.

1. $\frac{5x}{4} - \frac{3}{x} = \frac{1}{4}$

2. $\frac{5}{2x} - \frac{2}{3} = \frac{1}{x} + \frac{5}{6}$

Problem 2 Using Rational Equations

Got It?   **a.** You ride your bike to a store, 4 mi away, to pick up things for dinner. When there is no wind, you ride at 10 mi/h. Today your trip to the store and back took 1 hour. What was the speed of the wind today?

A Practice   **3. Transportation** The speed s of an airplane is given by $s = \frac{d}{t}$, where d represents the distance and t is the time.

a. A plane flies 700 miles from New York to Chicago at a speed of 360 mi/h. Find the time for the trip.

b. On the return trip from Chicago to New York, a tail wind helps the plane move faster. The total flying time for the round trip is 3.5 h. Find the speed of the tail wind.

Problem 3 Using a Graphing Calculator to Solve a Rational Equation

Got It?   What are the solutions of the rational equation $\frac{x+2}{1-2x} = 5$? Use a graphing calculator to solve.

A Practice Graphing Calculator Solve each equation. Check each solution.

4. $\frac{1}{3x} = -2$

5. $\frac{2}{x-1} + \frac{3}{x+1} = 4$