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Solving Rational Expressions

Unit 11 Lesson 5

Solving Rational Expressions

Students will be able to:

solve rational expression by simplifying and performing operation on fraction.

Key Vocabulary:

- Solution set
- Least common multiple
- Unknown values

Solving an Equation Containing Rational Expressions

1. Multiply both sides of the equation by the LCD.
2. Solve the resulting equation.
3. Check the solution to determine whether it is an excluded value and therefore extraneous

Solving Rational Expressions

Sample Problem 1: Solve the following rational expression by finding the value of the unknown variable.

$$1. \frac{3}{x-7} + 5 = \frac{8}{x-7}$$

$$2. \frac{v}{v-3} = 4 - \frac{3}{3-v}$$

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

$$4. \frac{y-9}{y} = \frac{3}{4}$$

Solving Rational Expressions

Sample Problem 1: Solve the following rational expression by finding the value of the unknown variable.

$$1. \frac{3}{x-7} + 5 = \frac{8}{x-7}$$

Solution:

$$\frac{3}{x-7} + 5 = \frac{8}{x-7}$$

$$x-7 \left[\frac{3}{x-7} + 5 = \frac{8}{x-7} \right]$$

$$\cancel{(x-7)} \left(\frac{3}{\cancel{x-7}} \right) + (x-7)5 = \cancel{(x-7)} \left(\frac{8}{\cancel{x-7}} \right)$$

$$3 + 5(x-7) = 8$$

$$5x = 8 + 32$$

$$5x = 40$$

$$x = 8$$

Solving Rational Expressions

Sample Problem 1: Solve the following rational expression by finding the value of the unknown variable.

$$2. \frac{v}{v-3} = 4 - \frac{3}{3-v}$$

Solution:

$$\frac{v}{v-3} = 4 - \frac{3}{3-v}$$

$$v = 4v - 12 + 3$$

$$-3v = -9$$

$$v = 3$$

$$v-3 \left[\frac{v}{v-3} = 4 - \frac{3}{3-v} \right]$$

$$\cancel{(v-3)} \left(\frac{v}{\cancel{v-3}} \right) = (v-3)(4) + \cancel{(v-3)} \left(\frac{3}{\cancel{v-3}} \right)$$

Solving Rational Expressions

Sample Problem 1: Solve the following rational expression by finding the value of the unknown variable.

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

Solution:

$$\frac{x}{2} + \frac{x}{3} = 5 + x$$

$$3x + 2x = 30 + 6x$$

$$-30 = 6x - 5x$$

$$x = -30$$

$$6\left[\frac{x}{2} + \frac{x}{3} = 5 + x\right]$$

$$6\left(\frac{x}{2}\right) + 6\left(\frac{x}{3}\right) = 6(5) + 6(x)$$

Solving Rational Expressions

Sample Problem 1: Solve the following rational expression by finding the value of the unknown variable.

$$4. \frac{y-9}{y} = \frac{3}{4}$$

Solution:

$$\frac{y-9}{y} = \frac{3}{4}$$

$$4y \left[\frac{y-9}{y} = \frac{3}{4} \right]$$

$$4y \left(\frac{y-9}{y} \right) = 4y \left(\frac{3}{4} \right)$$

$$4y - 36 = 3y$$

$$y = 36$$

Solving Rational Expressions

Sample Problem 2: Find solution for the following rational expressions.

$$5. \frac{m}{m-2} = \frac{m}{m-2} + 7$$

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

Solving Rational Expressions

Sample Problem 2: Find solution for the following rational expressions.

$$5. \frac{m}{m-2} = \frac{m}{m-2} + 7$$

Solution:

$$m-2 \left[\frac{m}{m-2} = \frac{m}{m-2} + 7 \right]$$

$$\cancel{m-2} \left(\frac{m}{\cancel{m-2}} \right) = \cancel{m-2} \left(\frac{m}{\cancel{m-2}} \right) + (m-2)7$$

$$m = m + 7m - 14$$

$$7m = 14$$

$$m = 2$$

Checking:

$$\frac{m}{m-2} = \frac{m}{m-2} + 7 \quad \frac{2}{2-2} = \frac{2}{2-2} + 7$$
$$\frac{2}{0} = \frac{2}{0} + 7$$

No solution

The solution set is $\{\emptyset\}$

Solving Rational Expressions

Sample Problem 2: Find solution for the following rational expressions.

$$6.1 + \frac{6}{x^2 - 9} = \frac{1}{x - 3}$$

Solution:

$$1 + \frac{6}{x^2 - 9} = \frac{1}{x - 3} \quad (x + 3)(x - 3) \left[1 + \frac{6}{x^2 - 9} = \frac{1}{x - 3} \right]$$

$$(x + 3)(x - 3)(1) + \cancel{(x + 3)(x - 3)} \left(\frac{6}{\cancel{x^2 - 9}} \right) = (x + 3) \cancel{(x - 3)} \left(\frac{1}{\cancel{x - 3}} \right)$$

$$(x + 3)(x - 3) + 6 = (x + 3)$$

$$x^2 - 9 + 6 = x + 3$$

$$x^2 - 3 = x + 3$$

$$x^2 - x - 3 - 3 = 0$$

$$x^2 - x - 6 = 0$$

$$(x - 3)(x + 2) = 0$$

$$x - 3 = 0; x + 2 = 0$$

$$x = 3; x = -2$$

Solving Rational Expressions

Sample Problem 2: Find solution for the following rational expressions.

$$6.1 + \frac{6}{x^2 - 9} = \frac{1}{x - 3}$$

Checking:

$$x = 3$$

$$1 + \frac{6}{(3)^2 - 9} = \frac{1}{3 - 3}$$

$$1 + \frac{6}{0} = \frac{1}{0}$$

3 is not a solution.

$$x = -2$$

$$1 + \frac{6}{(-2)^2 - 9} = \frac{1}{-2 - 3}$$

$$1 - \frac{6}{5} = -\frac{1}{5}$$

$$\frac{-5 + 6}{5} = -\frac{1}{5}$$

$$-\frac{1}{5} = -\frac{1}{5}$$

The solution is -2