

Lesson 6 Solving Rational Equations

Recall: Solving an algebraic equation means determine the values of the variable that make the given equation true.

Steps to Solve Rational Equations:

- Factor and State Restrictions
- Multiply each side of the equation by the LCD to clear the equation of fractions.
- Solve the equation for the given variable.
- Check for and reject any *extraneous roots*.

Examples: Solve each of the following.

1. $\frac{x+1}{x-1} = \frac{x-1}{x+3}$ $x \neq -3, 1$

LCD $(x-1)(x+3)$

$$(x+1)(x+3) = (x-1)(x-1)$$

$$x^2 + 4x + 3 = x^2 - 2x + 1$$

$$6x = -2$$

$$x = -\frac{1}{3}$$

check that the solution is not a restricted value

2. $\frac{1}{x} + 3 = \frac{4}{x^2}$ $x \neq 0$

LCD x^2

$$x + 3x^2 = 4$$

$$3x^2 + x - 4 = 0$$

$$(x-1)(3x+4) = 0$$

$$x = 1 \quad x = -\frac{4}{3}$$

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$$3. \frac{2}{x^2-4} + \frac{10}{6x+12} = \frac{1}{x-2}$$

$$\frac{2}{(x-2)(x+2)} + \frac{10}{6(x+2)} = \frac{1}{x-2} \quad x \neq \pm 2$$

LCD
 $6(x-2)(x+2)$

$$2(6) + 10(x-2) = 6(x+2)$$

$$\cancel{12} + 10x - 20 = 6x + \cancel{12}$$

$$4x = 20$$

$$x = 5 \quad \checkmark$$

$$4. \frac{6}{x-3} = \frac{x+3}{x^2-9} - 5$$

$$\frac{6}{x-3} = \frac{\cancel{x+3}}{\cancel{(x+3)}(x-3)} - 5 \quad x \neq \pm 3$$

LCD
 $(x-3)$

$$6 = 1 - 5(x-3)$$

$$6 = 1 - 5x + 15$$

$$5x = 10$$

$$x = 2 \quad \checkmark$$

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$$5. \frac{x}{x+2} - 3 = -\frac{6}{x^2-4}$$

$$\frac{x}{x+2} - 3 = \frac{-6}{(x+2)(x-2)}$$

$$x \neq \pm 2$$

$$x(x-2) - 3(x^2-4) = -6$$

$$x^2 - 2x - 3x^2 + 12 = -6$$

$$0 = 2x^2 + 2x - 18$$

÷2

$$0 = x^2 + x - 9$$

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

$$x = \frac{-1 \pm \sqrt{1 - 4(1)(-9)}}{2(1)}$$

$$x = \frac{-1 \pm \sqrt{37}}{2} \quad \checkmark$$

$$6. \frac{4x-1}{x+2} - \frac{x+1}{x-2} = -\frac{x^2-4x+24}{x^2-4}$$

on next page

$$\frac{4x-1}{x+2} - \frac{x+1}{x-2} = \frac{-(x^2-4x+24)}{(x-2)(x+2)}$$

$$(4x-1)(x-2) - (x+1)(x+2) = -x^2 + 4x - 24$$

$$4x^2 - 9x + 2 - (x^2 + 3x + 2) = -x^2 + 4x - 24$$

$$4x^2 - 9x + 2 - x^2 - 3x - 2 = -x^2 + 4x - 24$$

$$4x^2 - 16x + 24 = 0$$

$$x^2 - 4x + 6 = 0$$

$$x = \frac{4 \pm \sqrt{16 - 4(1)(6)}}{2(1)}$$

$$x = \frac{4 \pm \sqrt{-8}}{2}$$

∴ no sol'n

redo w/o -ve

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$$\frac{4x-1}{x+2} - \frac{x+1}{x-2} = \frac{x^2-4x+24}{(x+2)(x-2)}$$

$$x \neq \pm 2$$

$$(4x-1)(x-2) - (x+1)(x+2) = x^2-4x+24$$

$$4x^2 - 9x + 2 - (x^2 + 3x + 2) = x^2 - 4x + 24$$

$$4x^2 - 9x + 2 - x^2 - 3x - 2 = x^2 - 4x + 24$$

$$2x^2 - 8x - 24 = 0$$

$$x^2 - 4x - 12 = 0$$

$$(x-6)(x+2) = 0$$

$$x = 6 \quad \cancel{x = -2} \text{ rej extraneous root}$$

riddle sheet
(extra pg 82-84)

Review pg 94
#1-4, 6, 7