

8-5 Solving Rational Equations

Objective: Solve rational equations

Steps

1. Factor all denominators
2. State extraneous solutions (also called restricted values)
(values that make denominator equal 0)
3. Find LCD (greatest exponent of each factor)
4. Multiply every numerator by the LCD =
5. Cancel from top to bottom
6. SOLVE--if you have x^2 then factor or use Quad Form.
7. CHECK

Example 1: Solve.

$$\frac{x}{1} \left(x - \frac{18}{x} \right) = 3 \cdot x$$

$$x^2 - 18 = 3x$$

$$x^2 - 3x - 18 = 0$$

$$(x - 6)(x + 3) = 0$$

$$x - 6 = 0 \quad x + 3 = 0$$

$$x = 6 \quad x = -3$$

Example 2: Solve.

$$\frac{(x+2)(x-2)}{1} \cdot \frac{x}{(x+2)} + \frac{x+2}{(x-2)} = \frac{x+3}{(x-2)} \cdot \frac{(x+2)(x-2)}{1}$$

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

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

$$x^2 - 2x - x^2 - 4x - 4 = x^2 + 5x + 6$$

$$\begin{array}{r} -6x - 4 \\ +6x + 4 \end{array} = \begin{array}{r} x^2 + 5x + 6 \\ +6x + 4 \end{array}$$

$$0 = x^2 + 11x + 10$$

$$0 = (x+10)(x+1)$$

$$x+10=0 \quad x+1=0$$

$$x = -10 \quad x = -1$$

Example 3: Solve.

$$\frac{\cancel{(y+2)}(y-5)}{1} \cdot \frac{7}{\cancel{y+2}} = \frac{6}{\cancel{y-5}} \cdot \frac{(y+2)\cancel{(y-5)}}{1}$$

$$7(y-5) = 6(y+2)$$

$$\begin{array}{r} 7y - 35 \\ -6y + 35 \end{array} = \begin{array}{r} 6y + 12 \\ -6y + 35 \end{array}$$

$$y = 47$$

Example 4: Solve.

$$\frac{6(2x+1)}{1} \left[\frac{x}{3} + \frac{3}{4x+2} \right] = \frac{x+2}{2x+1} \cdot \frac{6(2x+1)}{1}$$

$$2 \cdot (x+1) + 3 \cdot 3 = 6(x+2)$$

$$4x^2 + 2x + 9 = 6x + 12$$

$$\begin{array}{r} 4x^2 + 2x + 9 \\ -6x - 12 \\ \hline \end{array}$$

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

$$(2x+1)(2x-3) = 0$$

$$2x+1=0$$

$$x = -\frac{1}{2}$$

$$2x-3=0$$

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

Example 5: Solve.

$$\frac{15(y+2)}{1} \cdot \left(\frac{3}{y+2} + \frac{7}{15} \right) = \left(\frac{23}{3y+6} \right) \cdot \frac{15(y+2)}{1}$$

$$\begin{array}{c} 3 \cdot 5 \\ 3(y+2) \end{array}$$

$$15 \cdot 3 + 7(y+2) = 5 \cdot 23$$

$$45 + 7y + 14 = 115$$

$$7y + 59 = 115$$

$$\begin{array}{r} 7y + 59 = 115 \\ -59 \quad -59 \\ \hline \end{array}$$

$$7y = 56$$

$$y = 8$$