

# Solving Rational Equations

ex

Solve

a)

$$\frac{3}{5} + \frac{2}{3} = \frac{x}{9}$$

$$LCD(5, 3, 9) = 45$$

$$45 \left[ \frac{3}{5} + \frac{2}{3} \right] = \frac{x}{9} \cdot 45$$

$$\frac{9 \cdot 45 \cdot 3}{5} + \frac{15 \cdot 45 \cdot 2}{3} = 5x$$

$$27 + 30 = 5x$$

$$\frac{57}{5} = \frac{5x}{5}$$

$$\frac{57}{5} = x \rightarrow x = \frac{57}{5}$$

b)

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

Multiply through by LCD to clear DENs.

$$LCD = (x-1)(x+2)$$

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

$$(x+2)5 = (x-1)3$$

$$5x + 10 = 3x - 3$$

$$\frac{2x}{2} = \frac{-13}{2}$$

$$x = \frac{-13}{2}$$

$$\begin{array}{r} 5x + 10 \\ -3x - 10 \\ \hline \end{array} = \begin{array}{r} 3 \\ x - 3 \\ \hline \end{array}$$

$$x = \frac{-13}{2}$$

$$c) \frac{4}{x-3} + \frac{2x}{x^2-9} = \frac{1}{x+3}$$

$$\text{LCD} = (x+3)(x-3)$$

$$\frac{(x+3)(x-3)}{(x+3)(x-3)} \cdot \frac{4}{x-3} + \frac{2x}{(x+3)(x-3)} = \frac{1}{x+3} \cdot (x+3)(x-3)$$

$$4(x+3) + 2x = x-3$$

$$4x + 12 + 2x = x - 3$$

$$\begin{array}{r} 6x + 12 \\ -x - 12 \\ \hline \end{array} = \begin{array}{r} x - 3 \\ -x - 12 \\ \hline \end{array}$$

$$\frac{5x}{5} = \frac{-15}{5}$$

$$x = -3$$

doesn't check  
extraneous solution  
no solution

## Method

- ① Find the LCD of all DENs.
- ② Clear DENs by multiplying through by LCD.
- ③ solve
- ④ check (esp. make sure you don't get extraneous solutions)

$$d) \frac{3}{x^2 - 6x + 9} + \frac{x-2}{3x-9} = \frac{x}{2x-6}$$

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

$$\text{LCD} = 6(x-3)^2$$

$$18 + 2(x-3)(x-2) = 3x(x-3)$$

$$18 + 2(x^2 - 5x + 6) = 3x^2 - 9x$$

$$18 + 2x^2 - 10x + 12 = 3x^2 - 9x$$

$$\begin{array}{r} 2x^2 - 10x + 30 = 3x^2 - 9x \\ -2x^2 + 10x - 30 \quad -2x^2 + 10x - 30 \\ \hline \end{array}$$

$$0 = x^2 + x - 30$$

$$0 = (x - 5)(x + 6)$$

$$x - 5 = 0 \quad \text{or} \quad x + 6 = 0$$

$$x = 5 \quad \text{or} \quad x = -6 \quad \checkmark$$