

8.5 Solving Rational Equations & Inequalities

Obj: 1. Solve a rational eq. or ineq.

Solve: $\frac{x}{x-6} \neq \frac{1}{x-4}$

$$x(x-4) = x-6$$

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

$$x^2 - 5x + 6 = 0$$

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

$$x-2=0 \quad x-3=0$$

$$x=2 \quad x=3, \quad x \neq 6, 4$$

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$$\frac{x}{3} \neq \frac{1}{x-2}$$

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

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

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

$$x-3=0 \quad x+1=0 \quad x-2 \neq 0$$

$$x=3 \quad x=-1, \quad x \neq 2$$

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$$\frac{x}{x-3} + \frac{2x}{x+3} = \frac{18}{x^2-9}$$

$x-3 \neq 0$
 $x \neq 3$
 $x+3$
 $x^2-9 = (x+3)(x-3)$

Clearing the Fraction:

- Find LCD
LCD: $(x+3)(x-3)$
- Multiply everything by the LCD

$$\frac{x}{x-3} \frac{(x+3)(x-3)}{(x-3)(x-3)} + \frac{2x}{x+3} \frac{(x+3)(x-3)}{(x+3)(x-3)} = \frac{18}{x^2-9} \frac{(x+3)(x-3)}{(x+3)(x-3)}$$

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

$$x^2 + 3x + 2x^2 - 6x = 18$$

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

$$\frac{3}{3}(x^2 - x - 6) = \frac{0}{3}$$

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

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

~~$x = 3$~~ $x = -2$
extraneous $x \neq 3, -3$

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

$(x-2)(x-3)$

LCD: $(x-2)(x-3)$

$$\frac{x}{x-2} \frac{(x-2)(x-3)}{(x-2)(x-3)} + \frac{x}{x-3} \frac{(x-2)(x-3)}{(x-2)(x-3)} = \frac{3}{x^2-5x+6} \frac{(x-2)(x-3)}{(x-2)(x-3)}$$

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

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

$$2x^2 - 5x - 3 = 0$$

$$(2x^2 - 6x) + (x - 3) = 0$$

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

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

$$x-3=0 \quad 2x+1=0$$

~~$x = 3$~~ $x = -\frac{1}{2}$
extraneous $x \neq 2, 3$

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$$\cancel{\left(\frac{x-1}{x+2}\right)} < \left(\frac{3}{1}\right)(x+2) \quad \text{LCD: } x+2$$

$$\frac{x-1}{-3x+1} < \frac{3x+6}{-3x+1} \quad \text{and} \quad \frac{x+2}{-2} > \frac{0}{-2}$$

$$\frac{-2x}{-2} < \frac{7}{-2}$$

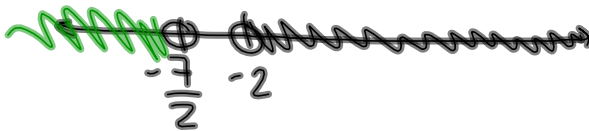
$$* x > -\frac{7}{2} \quad \text{and} \quad x > -2$$

$$x-1 > 3x+6 \quad \text{and} \quad x+2 < 0$$

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

$$\frac{-2x}{-2} > \frac{7}{-2}$$

$$\boxed{x < -\frac{7}{2} \quad \text{and} \quad x < -2}$$



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