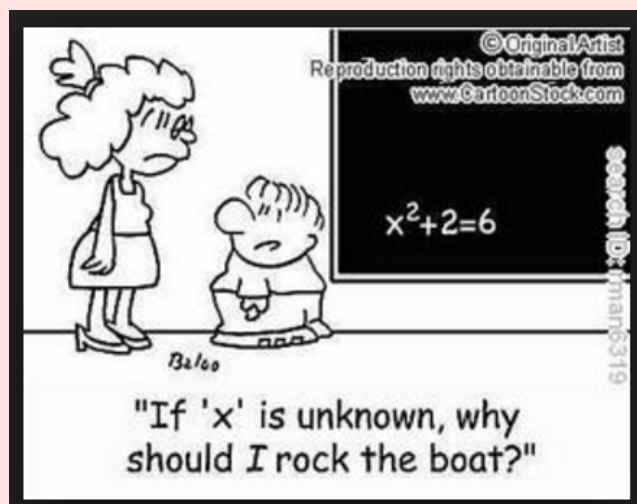# Solving Rational Equations and Inequalities
(Section 5.5)

Objectives:

~ Solve rational equations and inequalities

Try this:

$$\frac{x^2 - 9}{x + 3} = 7$$

$$\frac{x^2 + 3x - 4}{x - 1} = 5$$

What is a rational equation?

A **rational equation** is an equation that contains one or more rational expressions.

The time t in hours that it takes to travel d miles can be determined by using the equation t = d/r , where r is the average rate of speed. This equation is a rational equation.

Big Hint!

To solve a rational equation, multiply each and every term by the LCD.

This eliminates denominators! Much easier!

Well, Let's Jump Right In!

Solve the equations: Make sure to CHECK your answer(s)!

$$\frac{(x)\,x}{1} - \frac{(x)\,18}{x} = \frac{(x)\,3}{1}$$

$$x^2 - 3x - 18 = 0$$
$$(x-6)(x+3) = 0$$
$$\boxed{x = 6 \quad x = -3}$$

LCD: x

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

$$\frac{(x-2)\,5x}{(x-2)} = \frac{(x-2)\,3x+4}{(x-2)}$$

No solution

LCD: $(x-2)$

$$5x = 3x+4$$
$$-3x \quad -3x$$
$$2x = 4 \qquad \boxed{x = 2}$$

$$\frac{2x-5}{(x-8)} + \frac{x}{(2)} = \frac{11}{(x-8)}$$

LCD: $(2)(x-8)$

$$\frac{(2)(x-8)(2x-5)}{(x-8)} + \frac{(2)(x-8)(x)}{2} = \frac{(2)(x-8)(11)}{(x-8)}$$

$$4x - 10 + x^2 - 8x = 22$$

$$x^2 - 4x - 32 = 0$$
$$(x-8)(x+4) = 0$$
$$\boxed{x = 8 \quad x = -4}$$

Your Turn!

Solve each equation.

$$\frac{10}{3} = \frac{4}{x} + 2$$

$$\frac{16}{x^2 - 16} = \frac{2}{x - 4}$$
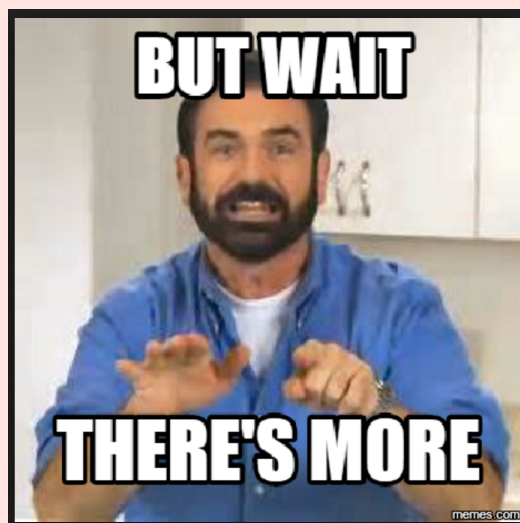
$$\frac{1}{x - 1} = \frac{x}{x - 1} + \frac{x}{6}$$

Word Problem (Yay!)

A kayaker spends an afternoon paddling on a river. She travels 3 mi upstream and 3 mi downstream in a total of 4 hours. In still water, the kayaker can travel at an average speed of 2mi/h. Based on this information, what is the average speed of the river's current? Is your answer reasonable?

More!

Rational Inequalities!

A **rational inequality** is an inequality that contains one or more rational expressions.

Can be solved by graphing which we will see next block!

You can also solve rational inequalities algebraically. You start by multiplying each term by the least common denominator (LCD) of all the expressions in the inequality. However, you must consider two cases: the LCD is positive or the LCD is negative.

Solving Rational Inequalities Algebraically

Solve $\dfrac{6}{x-8} \leq 3$ algebraically.

Case I: Positive   Case II: Negative

Solve the inequality algebraically

$$\frac{8}{x+5} \leq 4$$

Case I: Positive   Case II: Negative

Pop Problem!

$$\frac{3x}{x+2} - \frac{2}{x+4} \geq 7$$