

Solving Rational Equations!

* We do this when we have two rational expressions on opposite sides of the equal sign!

[Think back to Math 2 Unit!]

Example:

$$\frac{m-1}{5} = \frac{8}{2}$$

To solve, we need to cross multiply!

$$\frac{m-1}{5} = \frac{8}{2}$$

$$5(8) = 2(m-1)$$

Distribute!

$$40 = 2m - 2$$

Add 2

$$\frac{42}{2} = \frac{2m}{2}$$

Divide by 2!

$$21 = m$$

But we're not done yet, we need to check our answer! Even when our algebra is right, some times the solutions just don't work!

Check: $\frac{(21)-1}{5} \stackrel{?}{=} \frac{8}{2}$

$$\frac{20}{5} = \frac{8}{2}$$
$$4 = 4 \checkmark$$

$m=21$ is a solution!

If the solution does not work out, we call it extraneous!

Ex)

$$\frac{6x+5}{3x} = \frac{5}{3}$$

* Cross Multiply

$$\frac{6x+5}{3x} = \frac{5}{3}$$

$$3(6x+5) = 5(3x)$$

$$18x + 15 = 15x$$

$$-15x \quad -15x$$

$$3x + 15 = 0$$

$$-15 \quad -15$$

$$\frac{3x}{3} = \frac{-15}{3}$$

$$x = -5$$

CHECK:

$$\frac{6(-5)+5}{3(-5)} \stackrel{?}{=} \frac{5}{3}$$

$$\frac{-25}{-15} \stackrel{?}{=} \frac{5}{3}$$

$$\frac{5}{3} = \frac{5}{3} \checkmark$$

$$\boxed{x = -5 \checkmark}$$

it is a solution!

Sometimes there is a short cut!

$$\frac{x+5}{6x+7} = \frac{5x-3}{6x+7}$$

What do you notice about these rationals?
[The denominators match!] This makes
our job easier!

→ We can ignore denominators
and just look at our numerator!

Instead: $x+5 = 5x-3$

$$\begin{array}{r} -x \quad -x \end{array}$$

subtract x

$$5 = 4x - 3$$

$$+3$$

$$+3$$

add 3

$$\frac{8}{4} = \frac{4x}{4}$$

Divide by 4

$$2 = x$$

CHECK!

$$\frac{(2)+5}{6(2)+7} \stackrel{?}{=} \frac{5(2)-3}{6(2)+7}$$

$$\frac{7}{19} \checkmark = \frac{7}{19}$$

it works

$$x=2 \checkmark$$

Challenge Problem!

$$\frac{11-x}{3x} = \frac{-4}{x^2}$$

Cross Multiply!

$$x^2(11-x) = -4(3x)$$

$$11x^2 - x^3 = -12x$$

* We now have a degree of 2 and 3!

* Set one side equal to zero! I try to keep higher degree positive

$$0 = x^3 - 11x^2 - 12x$$

* Now Factor!

$$0 = x(x^2 - 11x - 12)$$

* GCF

$$0 = x(x-12)(x+1)$$

* Factor!

Solve for x:

$$x=0$$

x

$$x-12=0$$

$$x=12$$

✓

$$x+1=0$$

$$x=-1$$

✓

CHECK ANSWERS

only $x=12$ and $x=-1$ works!