LEARNING TARGET: I will solve equations containing rational algebraic expressions.

Solving Rational Equations

There are two methods to solve rational equations. You can:

- Cross Multiply
- Multiply each side by the least common denominator

You must always check for extraneous solutions by substituting back into the original equation.

Cross Multiplying

Example 1: Solve.

$$\frac{3}{x+1} = \frac{9}{4x+5}$$

$9(x+1) = 3(4x+5)$

$9x + 9 = 12x + 15$

$-9x - 15 \quad -9x - 15$

$\frac{-6}{3} = \frac{3x}{3}$

$-2 = x$

Check:

$\frac{3}{-2+1} = \frac{9}{4(-2)+5}$

$\frac{3}{-1} = \frac{9}{-3}$

$-3 = -3$ ✓

* Can also plug each side of ~~equation~~ into Y= on calc + use table function to make sure they are the same value on each side of the equation

Multiplying by LCD

Example 2: Solve.

$x(x-5)\left(1-\frac{8}{x-5}\right)=\frac{3}{x}(x-5)x$

$x(x-5)-8x=3(x-5)$

$x^2-5x-8x=3x-15$

$x^2-13x=3x-15$

$-3x \quad -3x+15$

$x^2-16x+15$

$(x-1)(x-15)$

$x=1 \quad x=15$

Check:

$1-\frac{8}{10}=\frac{3}{15}$

$\frac{2}{10}=\frac{1}{5}$

$\frac{1}{5}=\frac{1}{5}$ ✓

Check:

$1-\frac{8}{-4}=\frac{3}{1}$

$1-(-2)=3$

$3=3$ ✓

Example 3: Solve.

$$\frac{6}{x-3}=\frac{8x^2}{x^2-9}-\frac{4x}{x+3}$$

$(x+3)(x-3)\left(\frac{6}{x-3}\right)=\left(\frac{8x^2}{(x+3)(x-3)}-\frac{4x}{x+3}\right)(x+3)(x-3)$

$6(x+3)=8x^2-4x(x-3)$

$6x+18=8x^2-4x^2+12x$

$4x^2+6x-18$

$2(2x^2+3x-9)$

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

$x=\frac{3}{2}$ ✓ $\quad x=-3$ ext.

* can use Calc to help factor by finding zeros

* use calc to check by graphing both sides then use the table function to check