

Solving Rational Equations

Example Problems

$$\textcircled{1} \quad \frac{5}{2x-2} = \frac{15}{x^2-1}$$

← First cross multiply

simplify by dividing both sides by 5.

$$\frac{5}{5}(x^2-1) = \frac{15}{5}(2x-2)$$

$$x^2-1 = 3(2x-2)$$

distribute

$$x^2-1 = 6x-6$$

$$-6x+6$$

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

factor

$$(x-1)(x-5)=0$$

$$x-1=0 \quad \text{or} \quad x-5=0$$

$$x=1 \quad \text{or} \quad x=5$$

check for extraneous solutions

$$\begin{array}{r} \text{a.c} \\ \hline \begin{array}{cc} 5 & -5 \\ -1 & -6 \end{array} \\ \hline b \end{array}$$

if $x=1$ then you get

$$\frac{5}{0} = \frac{5}{0}$$

which is undefined

so only solution is

$$\boxed{x=5}$$

$$2) \quad \frac{3}{2x} - \frac{5}{3x} = 2$$

$$\text{LCD} = 6x$$

$$\frac{3}{3} \cdot \frac{3}{2x} - \frac{5}{3x} \cdot \frac{2}{2} = \frac{2}{1} \cdot \frac{6x}{6x}$$

$$\frac{9}{6x} - \frac{10}{6x} = \frac{12x}{6x}$$

$$9 - 10 = 12x$$

$$\frac{-1}{12} = 12x$$

$$\boxed{-\frac{1}{2} = x}$$

Can NOT

cross multiply

so ① get same denominator

② Take the TOPS

③ Solve for variable

Take the TOPS only

Solve for x

$$3) \quad \frac{3}{x+5} +$$

$$\frac{2}{5-x} = \frac{-4}{x^2-25}$$

factor out $a-1$ so looks like $x-5$

factor

$$+ \frac{\cancel{(x-5)} \cdot \frac{3}{\cancel{(x-5)}}}{x+5} + \frac{\cancel{(x+5)} \cdot \frac{-4}{\cancel{(x+5)}}}{(x-5)(x+5)}$$

$$\frac{3x-15}{(x-5)(x+5)} + \frac{-2x-10}{(x+5)(x-5)} = \frac{-4}{(x+5)(x-5)}$$

$$\text{LCD} = (x+5)(x-5)$$

← just take tops since denominators the same

$$3x-15-2x-10 = -4$$

$$x - 25 = -4$$

+ 25

$$\boxed{x = 21}$$