February 10, 2022

Complex Fractions

* Solving Rational Equations

$$\frac{\frac{1}{2}+\frac{2}{3}}{\frac{1}{5}+\frac{1}{2}} = \frac{\frac{3}{6}+\frac{4}{6}}{\frac{2}{10}+\frac{5}{10}} = \frac{\frac{7}{6}}{\frac{7}{10}} = \frac{7}{6}\cdot\frac{10}{7} = \frac{5}{3}$$

$$\frac{\frac{(x-2)x}{(x-2)x+2} - \frac{3(x+2)}{x-2(x+2)}}{\frac{(x+3)3x}{(x+3)x-2} - \frac{x+2(x-2)}{x+3(x-2)}} = \frac{\frac{x^2-2x-3x-6}{(x+2)(x-2)}}{\frac{3x^2+9x+(-x^2+4)}{(x-2)(x+3)}} = \frac{\frac{x^2-5x-6}{(x+2)(x-2)}}{\frac{2x^2+9x+4}{(x-2)(x+3)}}$$

$$= \frac{x^2-5x-6}{(x+2)(x-2)} \cdot \frac{(x-2)(x+3)}{2x^2+9x+4}$$

$$= \frac{(x-6)(x+1)}{(x+2)(x-2)} \cdot \frac{(x-2)(x+3)}{(2x+1)(x+4)}$$

$$= \frac{(x-6)(x+1)(x+3)}{(x+2)(2x+1)(x+4)}$$

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SOLVING Rational Equations

Simplify

* Answer: Expression with variables
* No = Sign
* Make + Keep common denoms; factor + cancel

Solving

* Answer: x = #'s
* Have an = sign
* Multiply by the common denominator + cancel all the denominators!

$$21\left[\frac{x}{3}+\frac{x}{7}=2\right]$$

$$7x+3x=42$$

$$\frac{10x}{10}=\frac{42}{10}$$

$$x=\frac{21}{5}$$

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

$$x^2(x+1) \quad x(x-2) \quad (x-2)(x+1)$$

$$(x)(x+1)(x-2)\left[\frac{x+5}{x^2(x+1)} - \frac{2}{x(x-2)} = \frac{-3}{(x-2)(x+1)}\right]$$

$$(x-2)(x+5) - 2x(x+1) = -3x^2$$

$$x^2+5x-2x-10-2x^2-2x = -3x^2$$

$$-x^2+x-10 = -3x^2$$

$$+3x^2$$

$$2x^2+x-10 = 0$$

$$(2x+5)(x-2) = 0$$

$x = -5/2$ $\quad x = 2$ extraneous solution

1) Factor the denominators!

a) Check for excluded values.

$x \neq 0, -1, 2$

3) Multiply by the common denom & cancel all the denoms!

4) Write down remaining terms.

5) Multiply & combine like terms

6) Set = to 0 & solve.

7) Check for excluded values!

Solve

$$(w-4)(w+1)\left[w + \frac{w+7}{w^2-3w-4} = \frac{w^2}{w-4}\right] \quad w \neq 4, -1$$

$$w\frac{(w-4)(w+1)}{w^2-3w-4} + w + 7 = w^2(w+1)$$

$$w^3 - 3w^2 - 4w + w + 7 = w^3 + w^2$$

$$-w^3 - 3w^2 - 3w + 7 = -w^3 + w^2 + 3w^2$$

$$0 = 4w^2 + 3w - 7$$

$$0 = (4w + 7)(w - 1)$$

$$w = -\frac{7}{4}, 1$$