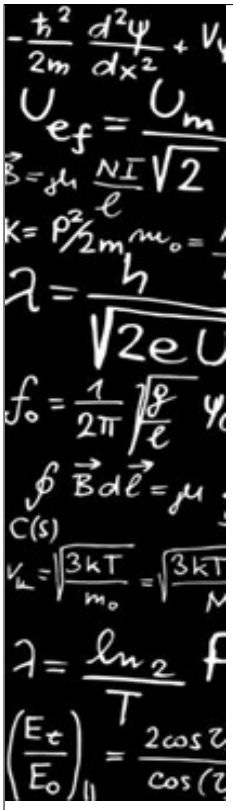

Unit 5 / Day 4

# Solving Rational Equations

**Objectives:**

Students will be able to add, subtract, multiply and divide complex fractions.

Students will be able to identify all necessary restrictions.

A2 Unit 5 / Day 4

**Solve the following for x.**
**State any restriction(s) on the variables.**
**Be sure to check for extraneous solutions!**

**EX #1:** $\frac{6(x+5)}{2x} - \frac{7}{3x} = \frac{5x}{12}$ CD: $12x$

$6x+30-28=5x$

$6x+2=5x$

$2=-x$

$x=-2$

Restrictions: $x \neq 0$

EX #1

**EX #2:**

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

CD: $2(x+1)(x-1)$

$(x+1)(x-1)$

$5x+5 = 30$

$5x = 25$

$x = 5$

$5x^2 - 5 = 30x - 30$

$5x^2 - 30x + 25 = 0$

$\frac{5(x^2-6x+5)}{5} = \frac{0}{5}$

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

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

$x = 5$ ~~$x = 1$~~

5, $-1$, $-5$, $-6$

Restrictions:

$x \neq \pm 1$

EX #2

**EX #3:**

$$\frac{11}{3x} - \frac{1}{3x^2} = -\frac{4}{3x^2}$$

CD: $3x^2$

$11x - 1 = -12$

$11x - x^2 = -12$

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

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

$x = 12$ $x = -1$

$-12$, $1$, $-12$, $-11$

Restrictions: $x \neq 0$

EX #3

**EX #4:** $\dfrac{7x+3}{x^2-8x+15} + \dfrac{3x}{x-5} = \dfrac{-1}{x-3}$

$(x-5)(x-3)$ $(x-5)$ $(x-3)$

15, $-5$, $-3$, $-8$

$7x+3+3x^2-9x = -1x+5$

$3x^2-1x-2=0$

| | $x$ | $-1$ |
|---|---|---|
| $3x$ | $3x^2$ | $-3x$ |
| $2$ | $2x$ | $-2$ |

$-6$, $-3$, $2$, $-1$

$(3x+2)(x-1)=0$

Restrictions: $x=-\frac{2}{3}$, $x=1$

$x=3,5$

EX #4

**Steps for Solving:**

1. factor denom | common denom
2. cross out denom (=)
3. solve the tops

steps

**Challenge:** $\frac{2}{x+2}+\frac{3}{x-3}=\frac{-1}{x-1}$

$(x-1)(x-3)$ $(x+2)(x-1)$ $(x-3)(x+2)$

CD: $(x+2)(x-3)(x-1)$

$2(x^2-3x-x+3)+3(x^2+2x-x-2)=-1(x^2-3x+2x-6)$

$2x^2-6x-2x+6+3x^2+6x-3x-6=-x^2+3x-2x+6$

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

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

$\frac{6(x^2-x-1)}{6}=\frac{0}{6}$

$x^2-x-1=0$

$x=\frac{1\pm\sqrt{1-4(1)(-1)}}{2}$

$=\frac{1\pm\sqrt{5}}{2}$

Restrictions:

$x\neq 1, 3, -2$

Challenge

(a) (A) $8x^3-27$ (B) $9x^4-37x^4+4$ (C) $3x^2-5x-2$ (D) $2x^2-13x+15$

(A) $(2x-3)(4x^2+6x+9)$

(B) $(9x^2-1)(x^2-4)$

$(3x+1)(3x-1)(x+2)(x-2)$

(C) $(x-2)(3x+1)$

(D) $(x-5)(2x-3)$

$*\ \frac{(2x-3)(4x^2+6x+9)(x-2)(3x+1)}{(3x+1)(3x-1)(x+2)(x-2)(x-5)(2x-3)}$

$\frac{4x^2+6x+9}{(3x-1)(x+2)(x-5)}$

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(b) $\frac{(3x-4)(x-3)}{2x^2+9x-5} - \frac{(x+2)(2x-1)}{x^2+2x-15}$

$(2x-1)(x+5)$ $(x-3)$ $\quad$ $(x+5)(x-3)$ $(2x-1)$

$$\frac{3x^2-9x-4x+12 + -2x^2+x-4x+2}{(2x-1)(x+5)(x-3)}$$

$$\frac{x^2-16x+14}{(2x-1)(x+5)(x-3)}$$

14, $-16$

Rest: $x \neq 3, -5, \frac{1}{2}$

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(g) $\dfrac{\frac{5}{x+4} + \frac{-1(x+4)}{1(x+4)}}{\frac{8}{1}\frac{(x+4)}{(x-4)} \cdot \frac{9}{x+4}} = \dfrac{\frac{5-x-4}{x+4}}{\frac{8x+32-9}{x+4}}$

$$\frac{(-x+1)}{(x+4)} \cdot \frac{(x+4)}{(8x+23)} = \frac{-x+1}{8x+23}$$

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(f) $\dfrac{\frac{1}{x}+\frac{11x}{1x}}{\frac{2}{y}-\frac{12y}{1y}}$ $\dfrac{\frac{1+11x}{x}}{\frac{2-12y}{y}}$

$\frac{1+11x}{x}\cdot\frac{y}{2-12y} = \frac{y(11x+1)}{2x(1-6y)}$

$2(1-6y)$

$x\neq 0 \quad y\neq\frac{1}{6} \quad y\neq 0$

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(c) $\dfrac{16x^2-9}{4x^2-17x-15} \div \dfrac{6x^2+17x+7}{6x^2-5x-4}$

(A) $(4x+3)(4x-3)$ (C) $(3x+7)(2x+1)$

(B) $(4x+3)(x-5)$ (D) $(3x-4)(2x+1)$

$\dfrac{(4x+3)(4x-3)(3x-4)(2x+1)}{(4x+3)(x-5)(3x+7)(2x+1)}$ *

$\dfrac{(4x-3)(3x-4)}{(x-5)(3x+7)}$

Rest: $x\neq -\frac{3}{4}, 5, -\frac{7}{3}, -\frac{1}{2}, \frac{4}{3}$

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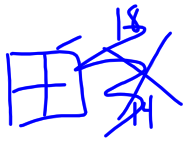
(d) $\frac{(3x-1)(x+2)}{x^2-49} + \frac{(3x+2)(x+7)}{x^2-5x-14}$

$\frac{(3x-1)(x+2)}{(x+7)(x-7)} + \frac{(3x+2)(x+7)}{(x-7)(x+2)}$

$= \frac{3x^2+6x-x-2+3x^2+2x+2x+14}{(x+7)(x-7)(x+2)}$

$= \frac{6x^2+28x+12}{(x+7)(x-7)(x+2)}$

$= \frac{2(3x^2+14x+6)}{(x+7)(x-7)(x+2)}$

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(e) $\frac{3}{2x+\frac{y}{x}} = \frac{3}{\frac{2x+y}{x}}$

$\times 1$

$\frac{3}{1} \cdot \frac{x}{2x+y} = \frac{3x}{2x+y}$

Rest: $2x+y \neq 0$ $x \neq 0$

$\frac{2x}{2} \neq \frac{-y}{2}$

$x \neq -\frac{y}{2}$ or $y \neq -2x$

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(h) $\dfrac{\frac{25yy}{xy} - \frac{36xx}{yx}}{\frac{5y}{xy} - \frac{6x}{yx}} = \dfrac{\frac{25y^2-36x^2}{xy}}{\frac{5y-6x}{xy}}$

$\dfrac{25y^2-36x^2}{xy} \cdot \dfrac{xy}{5y-6x}$

$\dfrac{(5y+6x)\cancel{(5y-6x)}\cancel{xy}}{\cancel{xy}\cancel{(5y-6x)}} = 5y+6x$

$x \neq 0$
$y \neq 0$

$5y-6x \neq 0$
$\frac{5y}{5} \neq \frac{6x}{5}$
$y \neq \frac{6x}{5}$

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(3) $y = -x^2(x+2)(x-4)^3$

(4) crosses at (2,0)
flattens at (-3,0)
bounces at (1,0)
passes through (-4,16)

Oct 23-9:55 AM

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

(6) $x = 0, -2+\sqrt{3}$

Oct 23-10:04 AM

(7) $x = 2-i, -1+2\sqrt{3}, -\frac{2}{3}$

Oct 23-10:13 AM