

Homework Qs

Note Title

4/16/2015

6.2: #27)

$$\frac{2x^2 + 10x + 12}{4x^2 + 24x + 32} \cdot \frac{2x^2 + 18x + 40}{x^2 + 8x + 15}$$

$$= \frac{2(x^2 + 5x + 6)}{4(x^2 + 6x + 8)} \cdot \frac{2(x^2 + 9x + 20)}{(x+5)(x+3)}$$

$$= \frac{2(\cancel{x+3})(\cancel{x+2})}{4(\cancel{x+2})(\cancel{x+4})} \cdot \frac{2(\cancel{x+4})(\cancel{x+5})}{(\cancel{x+5})(x+3)} = \frac{2 \cdot 2}{4} = \frac{4}{4} = \boxed{1}$$

6.2 #47)

$$\frac{2x^2 + 4x}{x^2 - y^2} \cdot \frac{x^2 + 3x + xy + 3y}{x^2 + 5x + 6}$$

$$\frac{(x+3)(x+y)}{(x+3)(x-y)}$$

Scratchwork
 $x^2 + 3x + xy + 3y$
 $(x^2 + 3x) + (xy + 3y)$
 $x(x+3) + y(x+3)$
 $(x+3)(x+y)$
 Check it!

6.2 #49)

$$\frac{x^3 - 3x^2 + 4x - 12}{x^4 - 16} \cdot \frac{3x^2 + 5x - 2}{3x^2 - 10x + 3}$$

$$\frac{(x-3)(x^2+4)}{(x-2)(x+2)(x^2+4)} \cdot \frac{(x-2)(x+3)}{(x-2)(x+3)}$$

Scratchwork:

$$(x^3 - 3x^2) + (4x - 12)$$

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

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

check!

$$x^4 - 16$$

$$(x^2)^2 - (4)^2$$

$$a^2 - b^2 = (a+b)(a-b)$$

$$\rightarrow (x^2 - 4)(x^2 + 4)$$

$$(x-2)(x+2)(x^2+4)$$

6.3 #9 $\left| \frac{x^2}{x+2} + \frac{4x+4}{x+2} \right|$

$$= \frac{x^2 + 4x + 4}{x+2} = \frac{(x+2)(x+2)}{x+2} = \frac{x+2}{1} = \boxed{x+2}$$

6.3: Adding and subtracting rational expressions

(cont'd.)

Don't forget the extra HW problems that were added last time.

Ex. Simplify.

$$\frac{2x}{x-7} + \frac{8}{x-9}$$

LCD: $(x-7)(x-9)$

$$= \frac{2x}{x-7} \left(\frac{x-9}{x-9} \right) + \frac{8}{x-9} \left(\frac{x-7}{x-7} \right)$$

$$= \frac{2x^2 - 18x + 8x - 56}{(x-7)(x-9)} = \frac{2x^2 - 10x - 56}{(x-7)(x-9)}$$

$$= \boxed{\frac{2(x^2 - 5x - 28)}{(x-7)(x-9)}}$$

Scratchwork

28
 1
 1 · 28
 2 · 14
 4 · 7

None

$$\begin{array}{r} 28 \\ 2 \overline{) 56} \\ \underline{4} \\ 16 \\ \underline{16} \\ 0 \end{array}$$

Ex.: Simplify.

$$\frac{2}{x+2} - \frac{6x+4}{x^2-4}$$

Factor all denominators.

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

$$\text{LCD: } (x+2)(x-2)$$

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

$$= \frac{2x-4-6x-4}{(x+2)(x-2)} = \frac{-4x-8}{(x+2)(x-2)} = \frac{-4(x+2)}{(x+2)(x-2)}$$

$$= \boxed{\frac{-4}{x-2}} = \boxed{-\frac{4}{x-2}}$$

Ex.: Simplify.

$$\frac{4x+1}{x^2-3x} - \frac{3x}{x^2-x-6}$$

Factor all denominators.

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

$$\text{LCD: } x(x-3)(x+2)$$

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

$$= \frac{4x^2+8x+1x+2-3x^2}{x(x-3)(x+2)} = \boxed{\frac{x^2+9x+2}{x(x-3)(x+2)}}$$

6.3 #46

$$\frac{3y}{y^2+7y+10} - \frac{2y}{y^2+6y+8}$$

$$= \frac{3y}{(y+2)(y+5)} + \frac{-2y}{(y+2)(y+4)} \quad \text{LCD: } (y+2)(y+5)(y+4)$$

$$= \frac{3y}{(y+2)(y+5)} \left(\frac{y+4}{y+4} \right) + \frac{-2y}{(y+2)(y+4)} \left(\frac{y+5}{y+5} \right)$$

$$= \frac{3y^2+12y-2y^2-10y}{(y+2)(y+5)(y+4)} = \frac{y^2+2y}{(y+2)(y+5)(y+4)}$$

$$= \frac{\cancel{y}(\cancel{y+2})}{(y+2)(y+5)(y+4)} = \boxed{\frac{y}{(y+5)(y+4)}} = \boxed{\frac{y}{(y+4)(y+5)}}$$

Both are equally correct.

6.4: Solving Equations with Rational Expressions

Ex.: Solve.

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

By inspection: $x=3$ makes the equation true.

$$\boxed{\text{Sol'n set: } \{3\}}$$

Another way:

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

$$5\left(\frac{x}{5} + \frac{1}{5}\right) = \frac{4}{5}(5)$$

$$\cancel{5}\left(\frac{x}{\cancel{5}}\right) + \cancel{5}\left(\frac{1}{\cancel{5}}\right) = \frac{4}{\cancel{5}}(\cancel{5})$$

$$x+1=4$$

$$x=3$$

LCD: 5
Multiply both sides by 5.

$$\boxed{\{3\}}$$

Ex: Solve.

$$\frac{x}{5} - \frac{4x}{3} = \frac{1}{15}$$

$$\frac{1}{15} \left(\frac{x}{5} \right) - \frac{4x}{3} \left(\frac{15}{15} \right) = \frac{1}{15} \left(\frac{15}{15} \right)$$

$$3x - 20x = 1$$

$$-17x = 1$$

$$\frac{-17x}{-17} = \frac{1}{-17}$$

$$x = -\frac{1}{17}$$

LCD: 15

Multiply both sides by 15.

Sol'n Set: $\left\{ -\frac{1}{17} \right\}$

Ex: Solve.

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

$$\frac{1}{6x} \left(\frac{1}{3x} \right) + \frac{-1}{6} \left(\frac{6x}{6x} \right) + \frac{5}{x} \left(\frac{6x}{6x} \right)$$

$$2 - x = 30$$

$$\frac{-1x}{-1} = \frac{28}{-1}$$

$$x = -28$$

LCD: 6x

Multiply both sides by 6x

Sol'n Set: $\left\{ -28 \right\}$

Ex: Solve.

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

$$\frac{2x}{x-3} \left(\frac{2}{2} \right) \left(\frac{x-3}{x-3} \right) - \frac{1}{2} \left(\frac{2}{2} \right) \left(\frac{x-3}{x-3} \right) = \frac{6}{x-3} \left(\frac{2}{2} \right) \left(\frac{x-3}{x-3} \right)$$

$$4x - 1(x-3) = 12$$

$$4x - x + 3 = 12$$

$$3x + 3 = 12$$

$$3x = 9$$

Cont'd next page

LCD: $2(x-3)$
Multiply both sides by $2(x-3)$

Note: Restrictions:
 $x \neq 3$

Previous example continued:

$$3x = 9$$

$$\frac{3x}{3} = \frac{9}{3}$$

$$x = 3$$

Check it: $\frac{2x}{x-3} - \frac{1}{2} = \frac{6}{x-3}$

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

$$\frac{6}{0} - \frac{1}{2} = \frac{6}{0}$$

Division by 0 is
totally meaningless!
(undefined).

Cannot have 0 denominators

Throw out $x=3$

No Solution.

— final answer

This is an example of an extraneous solution,

Extraneous Solution: (not a solution at all)

It is a ~~solution~~ ^{value} _{number} generated by a correct solution process, that does not check in the original equation.

Important: When solving an equation with variables in the denominator, you must check your solutions to see if they result in 0 denominators when substituted into the original equation. (If they do, throw them out)

Ex: Solve.

$$\frac{x+2}{x+3} = \frac{x-4}{x-2}$$

Restrictions: $x \neq -3$
 $x \neq 2$

LCD: $(x+3)(x-2)$
 multiply both sides by the LCD

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

$$\begin{aligned} (x-2)(x+2) &= (x-4)(x+3) \\ x^2 + 2x - 2x - 4 &= x^2 + 3x - 4x - 12 \\ \cancel{x^2} - 4 &= \cancel{x^2} - x - 12 \end{aligned}$$

$$\begin{array}{r} -4 \\ +12 \\ \hline 8 \end{array} = \begin{array}{r} -x - 12 \\ +12 \\ \hline -x \end{array}$$

$$\frac{8}{-1} = \frac{-x}{-1}$$

$$-8 = x$$

Does it make the denominators 0 in the original equation? No

Solution Set: $\{-8\}$