22. $\frac{u+4}{u+4} \cdot \frac{2u}{u^2 + 3u - 4} - \frac{u - 1}{u^2 + 8u + 16} \cdot \frac{u-1}{u-1}$

$(u+4)(u-1)$ $\quad$ $(u+4)(u+4)$

LCM: $(u+4)(u-1)(u+4)$

$$\frac{2u(u+4) - (u-1)(u-1)}{(u+4)(u-1)(u+4)}$$

$$\frac{2u^2 + 8u - u^2 + 2u - 1}{(u+4)(u-1)(u+4)}$$

$$\frac{u^2 + 10u - 1}{(u+4)(u-1)(u+4)}$$

Your Name
Mrs. T
/ /
Notes

Lesson 4-5

Solving Rational Equations

Pg 107

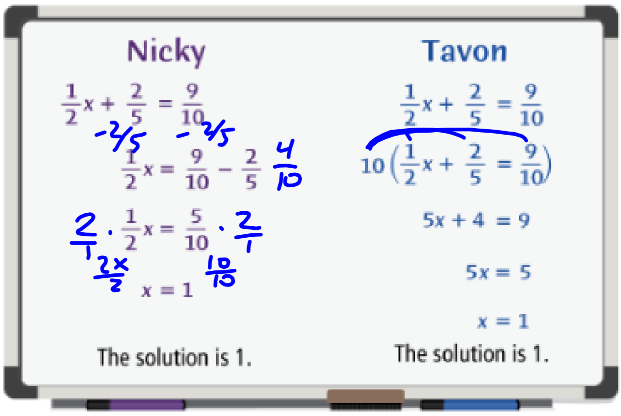
Objective: to be able to solve rational equations by simplifying first, and cross multiplying. And then determining if solutions are extraneous or not.

Virtue/Skill: All the skills we just learned in this chapter and chapter 10 are so that we can solve any type of algebraic equation like this and with radicals.

CRITIQUE & EXPLAIN

Nicky and Tavon used different methods to solve the equation $\frac{1}{2}x + \frac{2}{5} = \frac{9}{10}$.

A. Explain the different strategies that Nicky and Tavon used, and the advantages or disadvantages of each.



B. Did Nicky use a correct method to solve the equation? Did Tavon?

C. Use Structure Why might Tavon have chosen to multiply both sides of the equation by 10? Could he have used another number? Explain.

Solving Rational Equations is going to use either

1. like add/subtracting: get LCD and combine, then drop denominator or multiply diagonally.

or

2. like Complex fractions: multiply by the LCM of ALL denominators to <u>cancel</u> them <u>all</u> at once.

Equations... How do we solve for x here?

$$\frac{8}{x} = \frac{5}{40}$$

$$\cancel{x} \cdot \frac{8}{\cancel{x}} = \frac{5}{40} \cdot x$$

$$40 \cdot 8 = \frac{5x}{\cancel{40}} \cancel{40}$$

$$40 \cdot 8 = 5x$$

Cross Products

$$\frac{8}{x} = \frac{5}{40}$$

$$8 \cdot 40 = 5x$$

Equations... How do we solve for x here?

$$\frac{8}{40} + \frac{x}{40} = \frac{5}{40}$$

$$\frac{8+x}{40} = \frac{5}{40}$$

$$8 + x = 5$$

Method 1

Cross Products

When each side of the = equal sign has only one fraction, then you can multiply diagonals so that there are no denominators anymore

EXAMPLE 1 Solve a Rational Equation

Try It!

1. What is the solution to the rational equation?

a. $\frac{2}{x+5} = \frac{4}{1}$

$2 \cdot 1 = 4(x+5)$

$2 = 4x + 20$

$-18 = 4x$

$-4.5 = x$

b. $\frac{1}{x-7} = 2$

$1 = 2x - 14$

$+14 \qquad +14$

$15 = 2x$

$7.5 = x$

Method 1

Cross Products

When each side is only one fraction, then you can cross multiply so that there are no denominators anymore

*Make sure to check in the original for extraneous solutions

**plug answers into denominators, if it makes the denominator 0 then it is called extraneous

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

$$\frac{2}{x^2-36} - \frac{1}{x-6} = 0$$

Method 1

Cross Products

When each side of the = equal sign has only one fraction, then you can multiply diagonals so that there are no denominators anymore

EXAMPLE 1 Solve a Rational Equation

Try It!

1. What is the solution to the rational equation?

a. $\frac{2}{x+5} = 4$

$2 \cdot 1 = 4(x+5)$

$2 = 4x + 20$

$-18 = 4x$

$-4.5 = x$

b. $\frac{1}{x-7} = 2$

$1 \cdot 1 = 2(x-7)$

$1 = 2x - 14$

$15 = 2x$

$7.5 = x$

Method 1

Cross Products

When each side is only one fraction, then you can cross multiply so that there are no denominators anymore

$\frac{x}{3x} = \frac{7}{10}$

*Make sure to check in the original for extraneous solutions

**plug answers into denominators, if it makes the denominator 0 then it is called extraneous

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

$-5 \cdot 3 = (x+2)(x-1)$

$-15 = x^2 + x - 2$

$+15 \qquad +15$

$0 = x^2 + x + 13$

$x = \frac{-1 \pm \sqrt{1^2 - 4(1)(13)}}{2(1)}$

$x = \frac{-1 \pm \sqrt{-51}}{2}$

imaginary

$\boxed{\text{no Solution}}$

$$\frac{2}{x^2 - 36} - \frac{1}{x-6} = 0$$

$\frac{2}{x^2-36} = \frac{1}{x-6}$

$2(x-6) = 1(x^2-36)$

$2x - 12 = x^2 - 36$

$0 = x^2 - 2x - 24$

$0 = (x-6)(x+4)$

$\cancel{x=6}$ $\boxed{x = -4}$

EXAMPLE 5 Solve a Rate Problem

Paddling with the current in a river, Jake traveled 16 miles. Even though he paddled upstream for an hour longer than the amount of time he paddled downstream, Jake could only travel 6 miles against the current. In still water, Jake paddles at a rate of 5 mph. What is the speed of the current in the river?

EXAMPLE 5 Solve a Rate Problem

Try It!

5. Three people are planting tomatoes in a community garden. Marta takes 50 minutes to plant the garden alone, Benito takes x minutes and Tyler takes $x + 15$ minutes. If the three of them take 20 minutes to finish the garden, how long would it have taken Tyler alone?

Arthur and Cheyenne can paint a wall in 6 hours when working together. Cheyenne works twice as fast as Arthur. How long would it take Cheyenne to paint the wall if she were working alone?

COMMON ERROR
You might have multiplied x by 2 because Cheyenne works twice as fast. However, it takes Cheyenne *half* the time to paint the wall.
CLOSE

Rate = $\frac{\#}{\# hr}$

The fraction of a job completed per hour is the work-rate.

Arthur can paint 1 wall in x hours, or $\frac{1}{x}$ of a wall in 1 hour.

Cheyenne is twice as fast, so Cheyenne paints $\frac{2}{x}$ of a wall in 1 hour.

Together they paint 1 wall in 6 hours, or $\frac{1}{6}$ of a wall in 1 hour.

$$\underset{\text{Per 1}}{\overset{\text{Rate}}{\frac{1}{x}}} + \underset{\text{Per 2}}{\overset{\text{Rate}}{\frac{2}{x}}} = \underset{\text{total}}{\overset{\text{total rate}}{\frac{1}{6}}}$$

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

$$x = 18 \text{ hrs}$$

$$\frac{1}{\frac{1}{2}x} = 1 \cdot \frac{2}{x}$$

$$\boxed{\frac{1}{0.5x} = \frac{2}{x}}$$

EXAMPLE 2 Solve a Work-Rate Problem

Try It!

2. It takes 12 hours to fill a pool with two pipes, where the water in one pipe flows three times as fast as the other pipe. How long will it take the slower pipe to fill the pool by itself?

Total

$$\frac{1}{\frac{1}{3}x} \text{ or } \underset{\text{Pipe 1}}{\frac{3}{x}} + \underset{\text{Pipe 2}}{\frac{1}{x}} = \underset{\text{Total}}{\frac{1}{12}}$$

$$\frac{4}{x} = \frac{1}{12}$$

$$x = \boxed{48 \text{ hrs}}$$

Arthur and Cheyenne can paint a wall in 6 hours when working together. Cheyenne works twice as fast as Arthur. How long would it take Cheyenne to paint the wall if she were working alone?

COMMON ERROR
You might have multiplied *x* by 2 because Cheyenne works twice as fast. However, it takes Cheyenne *half* the time to paint the wall.

CLOSE

$S = \frac{d}{t}$ $R = \frac{job}{time}$

	Rate speed	jobs done	time
A:	$\frac{1}{x}$	1	x
C:	$\frac{1}{0.5x} = \frac{2}{x}$	2 1	x $0.5x$
together	$\frac{1}{6}$	1	6 hrs

The fraction of a job completed per hour is the work-rate.

Arthur can paint 1 wall in x hours, or $\frac{1}{x}$ of a wall in 1 hour.

Cheyenne is twice as fast, so Cheyenne paints of a wall in 1 hour.

Together they paint 1 wall in 6 hours, or $\frac{1}{6}$ of a wall in 1 hour.

$$\frac{1}{x} + \frac{2}{x} = \frac{1}{6} \rightarrow \frac{3}{x} = \frac{1}{6}$$

A + C = Total $x = 18$

EXAMPLE 2 **Solve a Work-Rate Problem**

Try It!

2. It takes 12 hours to fill a pool with two pipes, where the water in one pipe flows three times as fast as the other pipe. How long will it take the slower pipe to fill the pool by itself?

	Speed	job	time
Pipe1	$\frac{1}{x}$	1	x
Pipe2	$\frac{3}{x}$	1 3	$\frac{1}{3}x$ x
together	$\frac{1}{12}$	1	12

$$\frac{1}{x} + \frac{3}{x} = \frac{1}{12}$$

$$\frac{4}{x} = \frac{1}{12}$$

$x = 48$ hrs for slower pipe
16 hrs for faster pipe

A motorboat is capable of traveling at a speed of 15 miles per hour in still water. On a particular day, it took 15 minutes longer to travel a distance of 5 miles upstream than it took to travel the same distance downstream. What was the rate of current in the stream on that day?

Relationship given

upstream time = downstream time + 15 min

" " = " " + $\frac{1}{4}$ of an hour

time (hrs) = time (hrs) + $\frac{1}{4}$ hr

$t = \frac{d}{s}$

$$\frac{5 \text{ miles}}{15-c} = \frac{5 \text{ miles}}{15+c} + \frac{1}{4}$$

15 − c: mph, current speed slowing you down
15 + c: mph, current helping you

	speed	distance	time
upstream	15−c mph	5 miles	$\frac{5}{15-c}$
Down stream	15+c mph	5 miles	$\frac{5}{15+c}$
still water	15 m/h	5 miles	20 min

$$\frac{5(15+c)}{(15-c)(15+c)} - \frac{5(15-c)}{(15+c)(15-c)} = \frac{1}{4}$$

$$\frac{75+5c-75+5c}{(15-c)(15+c)} = \frac{1}{4}$$

$$\frac{10c}{(15-c)(15+c)} = \frac{1}{4}$$

$$40c = 225 - c^2$$

$$c^2 + 40c - 225 = 0$$

$$(c+45)(c-5) = 0$$

$$\boxed{c = 5 \text{ mph}}$$

A company wants to increase the 30% peroxide content of its product by adding pure peroxide (100% peroxide). If x liters of pure peroxide are added to 500 liters of its 30% solution, the concentration, C, of the new mixture is given by the formula below. How many liters of pure peroxide should be added to produce a new product that is 44% peroxide?

100%

$$(x+500)\, C = \frac{x + 0.3(500)}{x + 500} \cdot (x+500)$$

% (amount) + % (amount) = New % (total amount)

Same thing

$$\boxed{0.3(500) + 1.0x = 0.44(x+500)}$$

$$0.44 = \frac{x+0.3(500)}{x+500} \quad \text{or}$$

$$150 + x = 0.44x + 220$$

$$.56x = 70$$

$x = 125$ liters of pure peroxide

A motorboat is capable of traveling at a speed of 15 miles per hour in still water. On a particular day, it took 15 minutes longer to travel a distance of 5 miles upstream than it took to travel the same distance downstream. What was the rate of current in the stream on that day?

	Speed	distance	time
Upstream	$\frac{5}{x+15}$ miles per min	5 miles	$x+15$ min $= 30$
Down stream	$\frac{5}{x}$ miles per min	5 miles	x $= 15$
Still water	$15\frac{m}{h} = \frac{1}{4}$ mile/min	5 miles	20 min

$S = \frac{d}{t} = \frac{15}{60} = \frac{1}{4}$

$x =$ time

Current speed + still water speed = total downstream speed

$C + \frac{1}{4} = \frac{5}{15}$

$C =$ speed of current

$\frac{x}{x} \cdot \frac{5}{x+15} + \frac{5}{x} = \frac{1}{4}$

$\frac{5x + 5x + 75}{x(x+15)} = \frac{2}{4}$

$2x^2 + 30x = 40x + 300$

$2x^2 - 10x - 300 = 0$

$2(x^2 - 5x - 150) = 0$

$2(x+10)(x-15)$ min

$\cancel{x = -10}$ $x = 15$

$s = \frac{d}{t} \to 15 = \frac{5}{t} \to t = \frac{mil}{min}\frac{1}{15}$

$\frac{1}{4} + c = \frac{5}{15} = \frac{1}{3}$

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

$c = \frac{4}{12} - \frac{3}{12} = \frac{1}{12}$ mile $\cdot \frac{60 \text{ min}}{1 \text{ hr}} = 5$ mph convert to mph

Relationship given

Upstream time = downstream time + 15 min

" " = " " $+ \frac{1}{4}$ of an hour

time (hrs) = time (hrs) $+ \frac{1}{4}$ hr

$t = \frac{d}{s}$

$\frac{5 \text{ miles}}{15 - c} = \frac{5 \text{ miles}}{15 + c} + \frac{1}{4}$

mph current speed slowing you down; mph current helping you

$\frac{5(15+c)}{(15-c)(15+c)} - \frac{5(15-c)}{(15+c)(15-c)} = \frac{1}{4}$

$\frac{75 + 5c - 75 + 5c}{(15-c)(15+c)} = \frac{1}{4}$

$\frac{10c}{(15-c)(15+c)} = \frac{1}{4}$

$40c = 225 - c^2$

$c^2 + 40c - 225 = 0$

$(c+45)(c-5) = 0$

$\boxed{c = 5 \text{ mph}}$

	speed	distance	time
Upstream	$15-c$ mph	5 miles	$\frac{5}{15-c}$
Down stream	$15+c$ mph	5 miles	$\frac{5}{15+c}$
Still water	$15\frac{m}{h}$	5 miles	20 min

100%

A company wants to increase the 30% peroxide content of its product by adding pure peroxide (100% peroxide). If x liters of pure peroxide are added to 500 liters of its 30% solution, the concentration, C, of the new mixture is given by the formula below. How many liters of pure peroxide should be added to produce a new product that is 44% peroxide?

$$C = \frac{x + 0.3(500)}{x + 500}$$

% (amount) + % (amount) = New % (total amount)

$(x+500)$ $(x+500)$

Same thing

$0.44 = \frac{x + 0.3(500)}{x + 500}$ or

$0.3(500) + 1.0x = 0.44(x + 500)$

$150 + x = 0.44x + 220$

$.56x = 70$

$x = 125$ liters of pure peroxide

$s = \frac{d}{t}$

$s \cdot t = d$

$t = \frac{d}{s}$

<u>Speed</u>

6 mph + current

6 mph − current

hrs

$2\text{ hrs} = \frac{8\text{ miles}}{6-x}$

speed current

speed	dis	time
6+c	8	$\frac{8}{6+c}$
6−c	8	$2 = \frac{8}{6-c}$
6	8	$\frac{8}{6}$

13.

Speed	dist	time
255	510	$\frac{510}{255}$
255+X	510	$\frac{510}{255+x}$

$s = \frac{d}{t}$

$t = \frac{d}{s}$

$\underbrace{\frac{510}{255}}_{\text{time}} + \underbrace{\frac{510}{255+x}}_{\text{time}} = \underbrace{3.9}_{\text{total time}}$

Method 2

Multiply by LCD to Cancel All

Multiply each side of the equation by the Common Denominator

when you distribute, it will CANCEL ALL denominators at once

*Make sure to check in the original for extraneous solutions

plug answers into denominators, if it makes the denominator 0, that solution is invalid and it is called an ***extraneous solution*

EXAMPLE 3 Identify an Extraneous Solution

GCF • leftovers

Try It!

LCM: $(x+2)(x-2)$

3. What is the solution of the equation $\frac{1}{x+2} + \frac{1}{x-2} = \frac{4}{(x+2)(x-2)}$?

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

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

$$x-2+x+2=4$$

$$2x=4$$

$\cancel{x=2}$ extraneous

$\boxed{\text{No Solution}}$

LOOK FOR RELATIONSHIPS
How are an extraneous solution and an asymptote related? Is this always true?

Method 3

Getting a common denominator to ignore

Get common denominator, then the numerators must be equal

and the denominator can be ignored.

A. $\frac{5x}{x-2} = \frac{7}{1} + \frac{10}{x-2}$

$\frac{5x}{x-2} = \frac{7x-14}{x-2} + \frac{10}{x-2}$

All same now.

$5x = 7x - 14 + 10$

EXAMPLE 4 Solve Problems With Extraneous Solutions

Try It!

4. What are the solutions to the following equations?

a. $x + \frac{6}{x-3} = \frac{2x}{x-3}$

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

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

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

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

$\cancel{x=3}$ $\boxed{x=2}$

b. $\frac{x^2}{x+5} = \frac{25}{x+5}$

$\sqrt{x^2} = \sqrt{25}$

$x = \pm 5$

$\boxed{x=5}$

$x=-5$ is extraneous

Method 2

Multiply by LCD to Cancel All

Multiply each side of the equation by the Common Denominator

when you distribute, it will CANCEL ALL denominators at once

*Make sure to check in the original for extraneous solutions

plug answers into denominators, if it makes the denominator 0, that solution is invalid and it is called an ***extraneous solution*

EXAMPLE 3 Identify an Extraneous Solution

Try It!

3. What is the solution of the equation $\frac{1}{x+2} + \frac{1}{x-2} = \frac{4}{(x+2)(x-2)}$?

LCM: $(x+2)(x-2)$

GCF · Leftovers

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

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

$x-2+x+2=4$

$2x=4$

$\cancel{x=2}$

$\boxed{\text{No solution}}$

when plugged into denominator it makes $\frac{1}{0}$ = DNE its extraneous

LOOK FOR RELATIONSHIPS
How are an extraneous solution and an asymptote related? Is this always true?

Method 3

Get LCD
and ignore denominator

EXAMPLE 4 Solve Problems With Extraneous Solutions

Try It!

4. What are the solutions to the following equations?

A. $\frac{5x}{x-2} = 7 + \frac{10}{x-2}$ $(x-2)$ $(x-2)$

$$\frac{5x}{x-2} = \frac{7x-14+10}{x-2}$$

$$5x = 7x - 14 + 10$$

$x-3$

a. $x + \frac{6}{x-3} = \frac{2x}{x-3}$

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

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

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

$\cancel{x = 3}$ $x = 2$

b. $\frac{x^2}{x+5} = \frac{25}{x+5}$

Method 3

Getting a common denominator to ignore

Get common denominator, then the numerators must be equal and the denominator can be ignored.

$\frac{3}{1} \cdot \frac{14}{3}$

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

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

$$\frac{2x-6+3x}{6} = \frac{24}{6}$$

don't need denom

$$2x-6+3x=24$$

$$5x=30$$

$$x=6$$

$$\frac{\frac{14}{3}m+8}{2m} + \frac{m}{1} = \frac{4m}{6}$$

$$\frac{3}{3}\cdot\frac{\frac{14}{3}m+8}{2m} + \frac{m}{1}\cdot\frac{6m}{6m} = \frac{4m}{6}\cdot\frac{m}{m}$$

LCM: 6m

$$\frac{14m+24+6m^2}{6m} = \frac{4m^2}{6m}$$

$$2m^2+14m+24=0$$

$$2(m^2+7m+12)=0$$

$$2(m+3)(m+4)=0$$

$$\boxed{m=-3 \quad m=-4}$$

13. $\frac{m+4}{m+4} \cdot \frac{m-4}{m} - \frac{m-11}{(m+4)} \cdot \frac{m}{m} = \frac{1}{m} \cdot \frac{m+4}{m+4}$

$LCM: m(m+4)$

$\frac{m^2-16-m^2+11m}{m(m+4)} = \frac{m+4}{m(m+4)}$

because denominator is now the same, you don't need it until you check your solutions.

Combine like terms and set the numerators equal to each other

$10m+20=0$ $\quad -20+10m=0$

$m=2$

$$\frac{-1}{-1} \cdot \frac{m+1}{m-1} + \frac{m}{\underset{-1(-1+m)}{1-m}} = 1 \cdot \frac{-1(m-1)}{-1(m-1)}$$

LCM: $-1(m-1)$

$$\frac{-m-1+m}{-1(m-1)} = \frac{-m+1}{-1(m-1)}$$

$$m-2=0$$

$$m=2$$

Extraneous solutions

Values for the variable that are not solutions of the original equation because they make the denominator 0 (we can't divide by 0, then the equation wouldn't make sense)

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

$30(x-1) = 5x^2-5$

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

$-30x+30 \quad -30x+30$

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

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

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

$x-5=0 \qquad x-1=0$

$\boxed{x=5}$ ✓ $\qquad x=1$ X

$1^2-1=0$

1 would make $x^2-1=0$ and cause us to divide by 0

$$\frac{6x}{x - 1} + \frac{2x - 8}{x - 1} = 4$$

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

$\frac{8\cancel{(x-1)}}{\cancel{x-1}} = 4$

$8=4$

no solution.

cross multiplied

$4x-4=8x-8$

$-4x \qquad -4x$

$-4 = 4x-8$

$+8 \qquad +8$

$\frac{4}{4} = \frac{4x}{4}$

$x=1$

X

$(\cancel{x-3})(x+3)$

$$\frac{x^2-9}{\cancel{x-3}} + x^2 = 9$$

$x+3+x^2=9$

$x^2+x-6=0$

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

$\boxed{x=-3 \quad x=2}$

check in denominator for extraneous solutions

2 and -3 don't make denominator = 0

but 3 would

after factoring, x-3 canceled. And there is no denominator to work with. Just start solving.

BUT you do need to make sure your answers do not make that denominator = 0, if they do then you would not have been able to cancel it out in the first place.

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

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$3(2+4)$ $3(2)(4)$

4-5 Additional Practice

Solving Rational Equations

Multiply by LCM to Cancel All

LCM = GCF · Leftovers

LCM = $(x+5)x \cdot 5x(x-5)$

Name the Method you would use to solve. And Then, Solve each equation.

Fraction = Fraction

Cross Products

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

$5(x+4) = 1 \cdot 1$

$5x + 20 = 1$

$-20 \quad -20$

$\frac{5x}{5} = \frac{-19}{5}$

$x = -3.8$ ✓

2. $\frac{x+1}{x+2} = \frac{5}{x+2}$

already match

$x + 1 = 5$

$x = 4$

Get CD to ignore denominator

$\frac{3}{4} = \frac{x}{4}$

3. $\left(\frac{1}{5x^2} + \frac{4}{x^2+5x} = \frac{6}{x^2-25}\right) 5x^2(x+5)(x-5)$

$5 \cdot x \cdot x \quad x(x+5) \quad (x+5)(x-5)$

$\frac{5x^2(x+5)(x-5)}{5x^2} + \frac{20x^2(x+5)(x-5)}{x(x+5)} = \frac{30x^2(x+5)(x-5)}{(x+5)(x-5)}$

$x^2 - 25 + 20x(x-5) = 30x^2$

$x^2 - 25 + 20x^2 - 100x = 30x^2$

$0 = 9x^2 + 100x + 25$

$x = \frac{-100 \pm \sqrt{100^2 - 4(9)(25)}}{2(9)}$

$x = \frac{-100 \pm \sqrt{9100}}{18}$

$x = \frac{-100 \pm 95.39}{18}$

$\boxed{x = -0.26 \quad x = -10.86}$

4. $\frac{1}{2x-5} = \frac{1x}{5-2x}$

5. $2 - \frac{1}{x+3} = \frac{1}{x+3}$

$+\frac{1}{x+3}$

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

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

7. $\frac{1}{x+3} + \frac{1}{x-3} = \frac{6}{x^2-9}$

8. $\frac{3}{8x+16} = \frac{1}{4x-8} + \frac{3}{8x}$

9. $\frac{x^2}{x^2+10x} = \frac{30}{x+10} - \frac{10}{x}$