Bellwork: $\frac{(x-4)\,2x}{\cancel{x^2+x-12}} - \frac{3\,(x+4)}{\cancel{x^2-7x+12}}$

$(x-4)(x+4)(x-3) \quad (x-4)(x-3)(x+4)$

$$\frac{2x(x-4)-3(x+4)}{(x+4)(x-4)(x-3)} = 2x^2-8x-3x-12$$

$$\boxed{\frac{2x^2-11x-12}{(x+4)(x-4)(x-3)}}$$

Homework 4.4 Solutions

6) $\frac{k+3}{k^2-2k-15} + \frac{3k\,(k^2-2k-15)}{1\,(k^2-2k-15)}$

$$\frac{k+3+3k(k^2-2k-15)}{(k-5)(k+3)} = \frac{k+3+3k^3-6k^2-45k}{\text{blah}}$$

$$\boxed{\frac{3k^3-6k^2-44k+3}{(k-5)(k+3)}}$$

Lesson 4.5 Objectives

I can solve rational equations

VOCABULARY

A **rational equation** is an equation that contains one or more rational expressions (i.e., $\frac{3}{x+2}+\frac{1}{x-2}=\frac{x}{x^2-4}$ is a rational equation).

An **extraneous solution** is a solution of an equation that has been transformed or derived from the original equation but it is not a solution of the original equation. When working with rational functions you must check the solution in the original equation.

To solve a rational equation:

1) Determine any values that would make the denominator zero.
2) Find a common denominator (least common multiple between denominators).
3) Multiply all terms by common denominator.
4) Simplify and solve if possible.
5) Compare all answers with restriction to ensure that they are valid.

1. Solve: $\frac{2}{\cancel{3}} \cdot 2\cancel{6}x - \frac{1}{\cancel{x}} \cdot 6\cancel{x} = \frac{5}{\cancel{6}} \cdot \cancel{6}x$

1. $x \neq 0$
2. LCD: $6x$

$2x(2) - 1(6) = 5x$

$4x - 6 = 5x$

$-4x \qquad -4x$

$\boxed{-6 = x}$

2. Solve: $\frac{3}{\cancel{x+2}} + \frac{1}{\cancel{x-2}} = \frac{x}{\cancel{x^2-4}}$

$\cancel{(x+2)}(x-2)$ $(x+2)$ $\cancel{(x-2)}$ $x\cancel{(x+2)}\cancel{(x-2)}$

$\cancel{(x+2)}\cancel{(x-2)}$

1. $x \neq -2, 2$
2. LCD: $(x+2)(x-2)$

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

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

$4x - 4 = x - 4x$

$-4x$

$-4 = -3x$

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

$\boxed{x = 4/3}$

3. Solve: $\frac{8}{\cancel{x^2+8x+12}} = \frac{4}{\cancel{x+6}} + \frac{4}{\cancel{x+2}}$

$(x+6)$ $(x+2)$ $(x+6)(x+2)$ $(x+2)$ $(x+6)$

$(x+6)(x+2)$

1. $x \neq -6, 2$
2. LCD: $(x+6)(x+2)$

$8 = 4(x+2) + 4(x+6)$

$8 = 4x+8+4x+24$

$8 = 8x+32$

-32 $\quad$ -32

$\frac{-24}{8} = \frac{8x}{8}$

$\boxed{x = -3}$

4. A rare species of insect was discovered in the rain forest of Costa Rica. Environmentalists transplant the insect into a protected area. The population of the insect t months after being transplanted is $P(t) = \frac{46(1+0.6t)}{3+0.02t}$.

$$P = \frac{46(1+.6(0))}{3+.02(0)} = 15.\bar{3}$$

a. What was the population when t = 0? 15

b. What will the population be after 10 years?

c. When will there be 549 insects?

$$P = \frac{[46(1+.6(120))]}{[3+.02(120)]}$$

$$\frac{46(1+.6\times(120))}{3+.02(120)} \qquad \frac{3358}{5.4}$$

$$P = 621.85$$

$$\boxed{P = 621}$$

$$\frac{549}{1}(\cancel{3+.02t}) = \frac{46(1+.6t)}{\cancel{3+.02t}}(\cancel{3+.02t})$$

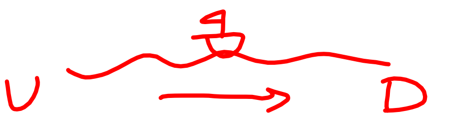
$$549(3+.02t) = 46(1+.6t)$$

$$1647 + \cancel{10.98t} = \cancel{46} + 27.6t$$
$$-46 \quad -\cancel{10.98t} \quad -\cancel{46} \quad -10.98t$$

$$\frac{1601}{16.62} = \frac{\cancel{16.62}t}{\cancel{16.62}}$$

$$t = 96.33 \text{ mon}$$

$$\boxed{t = 8 \text{ years}}$$



$$r \cdot t = d$$
$$t = d/r$$

5. A boat goes 450 miles downstream in the same time it can go 360 miles upstream. The speed of the current is 8 miles per hour. Find the speed of the boat in still water.

upstream: $t = \frac{360}{r-8}$ down: $t = \frac{450}{r+8}$

$$(\cancel{r-8})(r+8)\frac{360}{\cancel{r-8}} = \frac{450}{\cancel{r+8}}(r-8)(\cancel{r+8})$$

LCD: $(r-8)(r+8)$

$$360(r+8) = 450(r-8)$$

$$\cancel{360}r + 2880 = 450r - 36\cancel{00}$$
$$-\cancel{360}r \quad +3600 \quad -360r \quad +\cancel{36}00$$

$$\frac{6480}{90} = \frac{9\cancel{0}r}{\cancel{90}}$$

$$\boxed{r = 72}$$

$$\frac{4}{\cancel{r}}^{2r^2} = \frac{3}{\cancel{2r^2}}^{2r^2} - \frac{2}{\cancel{r}}^{2r^2}$$

$r \neq 0$

LCD: $2 \cdot r \cdot r$

$2r^2$

$$4 \cdot 2r = 3 - 2(2r)$$

$$\overline{x^2 + 3x}$$

$$x(x+3)$$