(6) $\frac{3}{(x+2)(x-2)} - \frac{(x+5)}{(x+2)} \cdot \frac{(x-2)}{(x-2)}$

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

$\frac{3}{(x+2)(x-2)} - \frac{(x^2-2x+5x-10)}{(x+2)(x-2)}$

$\frac{3}{(x+2)(x-2)} + \frac{(-x^2+3x+10)}{(x+2)(x-2)} = \boxed{\frac{-x^2-3x+13}{(x+2)(x-2)}}$

$x \neq -2, 2$

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

LCD: $(x+2)(x-3)$

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

4-3 Solving Rational Equations

Book Section 9-3 pgs 498-504

Objectives:

I can solve a rational equation algebraically

I can identify extraneous solutions

I can solve real-world problems using rational equations

Solving Rational Expressions

1. When one rational expression = one rational expression (proportion)...cross-multiply

2. When a sum or difference of rational expressions = another sum or difference of rational expressions...kill the denominator

Cross-Multiply

$\frac{3}{4} = \frac{x}{8}$

$3(8) = 4x$

$\frac{24}{4} = \frac{4x}{4}$

$x = 6$

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

$2x = 6(3)$

$\frac{2x}{2} = \frac{18}{2}$

$x = 9$

$\frac{6}{5} = \frac{2x}{5}$

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

$\frac{30}{10} = \frac{10x}{10}$

$3 = x$

$\frac{6}{2} = \frac{2x}{2}$

$\frac{2}{x} = \frac{x}{8}$

$2(8) = x^2$

$\pm\sqrt{16} = \sqrt{x^2}$

$\pm 4 = x$

$16 = x^2$

$-16 \quad -16$

$0 = x^2 - 16$

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

$x = -4, 4$

Cross-Multiply

$\frac{3}{4} = \frac{x+1}{8} = \frac{6}{8}$

$3(8) = 4(x+1)$

$24 = 4x + 4$

$-4 \quad -4$

$\frac{20}{4} = \frac{4x}{4}$

$5 = x$

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

$2(2x-3) = 6(3)$

$4x - 6 = 18$

$+6 \quad +6$

$\frac{4x}{4} = \frac{24}{4}$

$x = 6$

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

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

$30 = 5x - 25$

$+25 \quad +25$

$\frac{55}{5} = \frac{5x}{5}$

$11 = x$

$\frac{2}{(x+1)} = \frac{(x-1)}{12}$

$x \neq -1$

$12(2) = (x+1)(x-1)$

$24 = x^2 - 1x + 1x - 1$

$24 = x^2 - 1$

$-24 \quad -24$

$0 = x^2 - 25$

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

$x = 5, -5$

Cross-Multiply

$$\frac{1}{(x-2)} = \frac{x+2}{5x-10}$$

$x \neq 2$

$5(x-2)$

$1(5x-10) = (x-2)(x+2)$

$5x-10 = x^2+2x-2x-4$

$5x-10 = x^2-4$

$+10 \quad +10$

$5x = x^2+6$

$-5x \quad -5x$

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

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

$x = 2, 3$

$\boxed{x=3}$

Your Turn pg. 499

Solve each rational equation algebraically.

2. $\frac{8}{x+3} = \frac{x+1}{x+6}$

$x \neq -3, -6$

$8(x+6) = (x+3)(x+1)$

$8x+48 = x^2+1x+3x+3$

$8x+48 = x^2+4x+3$

$-8x \quad -48 \quad -8x \quad -48$

$0 = x^2-4x-45$

$0 = (x+5)(x-9)$

$x = -5, 9$

Solving Rational Expressions

1. When one rational expression = one rational expression (proportion)...cross-multiply

2. When a sum or difference of rational expressions = another sum or difference of rational expressions...kill the denominator

Kill the Denominator

$$\frac{1}{x+4}-\frac{3}{x}=\frac{2}{x+4} \qquad x\neq -4, 0$$

LCD: $(x+4)(x)$

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

$$1x-3x-12=2x$$

$$-2x-12=2x$$

$$+2x \quad +2x$$

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

$$-3=x$$

Solve the rational equation algebraically pg. 504

$$\frac{(x^2-29)}{x^2-10x+21} = \frac{6}{(x-7)} + \frac{5}{(x-3)}$$

$(x-7)(x-3)$

$x \neq 7, 3$

LCD: $(x-7)(x-3)$

$$\frac{(x^2-29)(x-7)(x-3)}{(x-7)(x-3)} = \frac{6(x-7)(x-3)}{(x-7)} + \frac{5(x-7)(x-3)}{(x-3)}$$

$x^2-29 = 6(x-3) + 5(x-7)$

$x^2-29 = 6x-18+5x-35$

$x^2-29 = 11x-53$

$+53 \quad +53$

$x^2+24 = 11x$

$-11x \quad -11x$

$x^2-11x+24 = 0$

$(x-8)(x-3) = 0$

$x = 8, 3$

Solution

10. Jake can mulch a garden in 30 minutes. Together, Jake and Ross can mulch the same garden in 16 minutes. How much time t, in minutes, will it take Ross to mulch the garden when working alone? pg. 506

Fractions:

$\frac{\text{amt of work}}{\text{amt of time}}$

Person #1 + Person #2 = together

Jake + Ross? = Together

$\frac{1 \text{ garden}}{30 \text{ min}} + \frac{1 \text{ gard}}{X} = \frac{1 \text{ garden}}{16 \text{ min}}$

$\frac{1}{(30)} + \frac{1}{(X)} = \frac{1}{16}$

LCD: $30(x)(16)$

$\frac{30(x)(16)}{30} + \frac{30(x)(16)}{x} = \frac{30(x)(16)}{16}$

$16x + 480 = 30x$

$-16x \quad -16x$

$480 = 14x$

$\frac{480}{14} = \frac{14x}{14}$

$x = 34.3$ minutes

Your Turn

4. Kevin can clean a large aquarium tank in about 7 hours. When Kevin and Lara work together, they can clean the tank in 4 hours. Write and solve a rational equation to determine how long, to the nearest tenth of an hour, it would take Lara to clean the tank if she works by herself. Explain whether the answer is reasonable.

Kevin + Lara = Together

$$\frac{1}{7} + \frac{1}{x} = \frac{1}{4}$$

LCD: $7(x)(4)$

$$4x + 28 = 7x$$
$$-4x \qquad -4x$$
$$28 = 3x$$
$$\frac{28}{3} = \frac{3x}{3}$$

$x = 28/3 = \boxed{9.3}$

Suppose Jeremy can paint an entire house in 12 hours and Carrie can paint the same house in 8 hours. How long would it take the two painters together to paint the house?

Jeremy + Carrie = Together

$$\frac{1}{12} + \frac{1}{8} = \frac{1}{x}$$

LCD: $12(8)(x)$

$$\frac{12(8)(x)}{12} + \frac{12(8)(x)}{8} = \frac{12(8)(x)}{x}$$