1.2.3 Solving Rational Equations

*eliminate denominators by multiplying through by the LCM

Steps-
1. Determine the LCM (may involve factoring)
2. Multiply through by LCM
3. Solve remaining equation
4. Determine domain restrictions.

$x \neq 0$

Solve & find the values that yield a zero in the denominator.

$10x$

$\left(\frac{1}{x} = \frac{1}{5} + \frac{1}{2x}\right)$

$10 = 2x + 5$

$5 = 2x$

$5/2 = x$

Solve for x and list any domain restrictions-

$$\left(\frac{x}{(x-3)} = \frac{3}{(x-3)} + 9\right)(x-3)$$

$$x = 3 + 9(x-3)$$

$$x = 3 + 9x - 27$$

$$-8x = -24$$

$$x = 3 \quad , \quad x \neq 3$$

no solutions

$\varnothing$

no solns.

Remember- "x" and "3" are terms, "x-3" is a factor and we must multiply by factors

Solve for x and list any domain restrictions-

$$\left(\frac{7}{2x} - \frac{5}{3x} = \frac{22}{3}\right)6x$$

$$21 - 10 = 44x$$

$$11 = 44x$$

$$11/44 = x$$

$$1/4 = x$$

domain res: $x \neq 0$

Solve for x and list any domain restrictions-

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

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

$$2x - 2 - x - 1 = 2x$$

$$x - 3 = 2x$$

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

$x \neq \pm 1$

How was this problem more complex?

...the denominator needed to be factored in order to determine which factors we needed to multiply to each term

Solve for x and determine any domain restrictions-

$$\left[\frac{3}{x+3} = \frac{5}{2x+6} + \frac{1}{x-2}\right] 2(x+3)(x-2)$$

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

$$6(x-2) = 5(x-2) + 2(x+3)$$

$$6x-12 = 5x-10+2x+6$$

$$6x-12 = 7x-4$$

$$\boxed{-8 = x}$$

$x \neq -3, 2$

Sec 1.2, page 118

Suggested Practice

(33,36,39,42,43,45,48,49)

don't forget domain restrctions

Solutions-

33. $a \neq 0$

$a = -2$

36. $a \neq 0$

$a = 3$

39. $a \neq 1$

$a = 3$

42. $a \neq 2$

a ---> no solutions

43. $a \neq 1$

$a = 2$

45. $a \neq +/- 2$

a ---> no solutions

45. $a \neq +/- 5$

$a = 7$

49. $a \neq -2,4$

a ---> no solutions

Note that the domain restriction(s) were listed first.

"+/-" means "plus or minus" (positive or negative) that number