Solve the following equation: $\dfrac{x}{4} + \dfrac{3x}{2} = 6$

$$\frac{x}{4} + \frac{6x}{4} = \frac{24}{4}$$

$$x + 6x = 24$$

$$\frac{7x}{7} = \boxed{\frac{24}{7}}$$

Mar 25-3:27 PM

Pre-Calculus 110
Unit 5: Rational Expressions and Equations

May 1, 2019: Day #7

1. Any Adding/Subtracting Questions?

Curriculum Outcomes

AN4: Determine equivalent forms of rational expressions (limited to numerators and denominators that are monomials, binomials or trinomials).

AN5: Perform operations on rational expressions (limited to numerators and denominators that are monomials, binomials or trinomials).

AN6: Solve problems that involve rational equations (limited to numerators and denominators that are monomials, binomials or trinomials).

Jan 29-9:29 AM

rational equation

- an equation containing at least one rational expression

- examples are

$$x = \frac{x-3}{x+1} \text{ and}$$

$$\frac{x}{4} - \frac{7}{x} = 3$$

To solve a rational equation,

- factor each denominator
- identify the non-permissible values
- multiply both sides of the equation by the lowest common denominator
- solve by isolating the variable on one side of the equation
- check your answers

Apr 30-10:37 AM

solve $\dfrac{x}{4} - \dfrac{7}{x} = \dfrac{3}{1}$ $x \neq 0$

$$\dfrac{x^2}{4x} - \dfrac{28}{4x} = \dfrac{12x}{4x}$$

$$x^2 - 28 = 12x$$

$$x^2 - 12x - 28 = 0$$

$$(x-14)(x+2) = 0$$

$$x = 14 \text{ or } -2$$

$x = 14$ ✓

$$\dfrac{14}{4} - \dfrac{7}{14} = 3$$

$$3.5 - .5 = 3$$

$$3 = 3$$

$x = -2$ ✓

$$\dfrac{-2}{4} - \dfrac{7}{-2} = 3$$

$$-0.5 + 3.5 = 3$$

$$3 = 3$$

Example 1

Solve a Rational Equation

Solve the following equation. What values are non-permissible?

$$\frac{2}{z^2 - 4} + \frac{10}{6z + 12} = \frac{1}{z - 2}$$

$$\frac{2}{(x-2)(x+2)} + \frac{10}{6(x+2)} = \frac{1}{x-2}$$

$$\frac{2 \times 6}{6(x-2)(x+2)} + \frac{10(x-2)}{6(x-2)(x+2)} = \frac{6(x+2)}{6(x-2)(x+2)}$$

$$12 + 10(x-2) = 6(x+2)$$

$$12 + 10x - 20 = 6x + 12$$

$$10x - 6x = 12 - 12 + 20$$

$$4x = 20$$

$$x = 5$$

$$\frac{2}{21} + \frac{10}{42} = \frac{1}{3}$$

$$\frac{2}{21} + \frac{5}{21} = \frac{7}{21}$$

Apr 30-10:46 AM

6

Your Turn

Solve the equation. What are the non-permissible values?

$$\frac{9}{y-3} - \frac{4}{y-6} = \frac{18}{y^2 - 9y + 18}$$

$$\frac{9}{y-3} - \frac{4}{y-6} = \frac{18}{(y-3)(y-6)}$$

$$\frac{9(y-6)}{(y-3)(y-6)} - \frac{4(y-3)}{(y-3)(y-6)} = \frac{18}{(y-3)(y-6)}$$

$$9y - 54 - 4y + 12 = 18$$

$$5y = 18 - 12 + 54$$

$$5y = 60$$

$$\boxed{y = 12}$$

$$\frac{9}{9} - \frac{4}{6} = \frac{18}{54}$$

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

Example 2

Solve a Rational Equation With an Extraneous Root

Solve the equation. What are the non-permissible values?

$$\frac{4k - 1}{k + 2} - \frac{k + 1}{k - 2} = \frac{k^2 - 4k + 24}{k^2 - 4}$$

$K = 6 \checkmark$

$$\frac{(4k-1)(k-2)}{(k+2)(k-2)} - \frac{-(k^2+2k+k+2)}{(k+2)(k-2)} = \frac{k^2-4k+24}{(k-2)(k+2)}$$

$$\frac{23}{8} - \frac{7}{4} = \frac{36}{32}$$

$$\frac{92}{32} - \frac{56}{32} = \frac{36}{32}$$

$$4k^2-8k-k+2 - k^2-2k-k-2 = k^2-4k+24$$

$$2k^2 - 8k - 24 = 0$$

$$k^2 - 4k - 12 = 0$$

$$(k-6)(k+2) = 0$$

$$k = 6 \text{ or } -2$$

Your Turn

Solve. What are the non-permissible values?

$$\frac{3x}{x+2} - \frac{5}{(x-3)} = \frac{-25}{x^2 - x - 6}$$

$x \neq -2, 3$

$$\frac{3x(x-3)}{(x+2)(x-3)} - \frac{5(x+2)}{(x+2)(x-3)} = \frac{-25}{(x-3)(x+2)}$$

$$3x^2 - 9x - 5x - 10 = -25$$

$P = 45$

$S = -14$

$-9, -5$

$$3x^2 - 14x + 15 = 0$$

$$3x^2 - 9x - 5x + 15 = 0$$

$$3x(x-3) - 5(x-3) = 0$$

$$(3x - 5)(x - 3) = 0$$

$$x = \frac{5}{3} \text{ or } \cancel{x}$$

Example 3

Use a Rational Equation to Solve a Problem

Two friends share a paper route. Sheena can deliver the papers in 40 min. Jeff can cover the same route in 50 min. How long, to the nearest minute, does the paper route take if they work together?

Example 4

Use a Rational Equation to Solve a Problem

The Northern Manitoba Trapper's Festival, held in The Pas, originated in 1916. A championship dog race has always been a significant part of the festivities. In the early days, the race was non-stop from The Pas to Flin Flon and back.

In one particular race, the total distance was 140 mi. Conditions were excellent on the way to Flin Flon. However, bad weather caused the winner's average speed to decrease by 6 mph on the return trip. The total time for the trip was $8\frac{1}{2}$ h. What was the winning dog team's average speed on the way to Flin Flon?
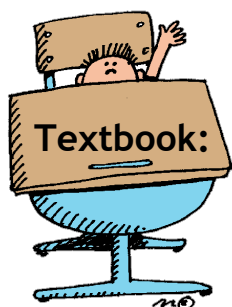
Minimum Preparation:

Textbook: p. 348-351

1ac, 2ac, 3ac, 4, 6a, 8, 9, 12, 14, 16, 18, 22