

Homework 5.4: Solving Rational Equations

Name: Key!

Math 3

Directions: Decide whether each of the following is an expression or an equation. If it is an equation, solve it. If it is an expression, write it as a single fraction.

1. $\frac{x}{4} - \frac{x}{7} = 3$ equation

$$\frac{7x - 4x}{28} = \frac{3}{1}$$

$$3x = 84$$

$$x = 28$$

$$x = 28$$

2. $\frac{x}{2} - \frac{x}{5}$ expression
CD: 10

$$\frac{5x - 2x}{10} = \frac{3x}{10}$$

3. $\frac{x}{6} - \frac{x}{8}$ expression
CD: 24

$$\frac{4x - 3x}{24} = \frac{x}{24}$$

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

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

$$3x+1 = 4x-4$$

$$-1x+1 = -4$$

$$-1x = -5$$

$$x = 5$$

5. $\frac{3x-1}{2} - \frac{x}{5} - \frac{x+3}{4}$ expression
CD: 20

$$\frac{10(3x-1) - 4(x) - 5(x+3)}{20}$$

$$(30x - 10 - 4x - 5x - 15)/20$$

$$\frac{21x - 25}{20}$$

6. $\frac{x}{4} = \frac{x}{12} + \frac{1}{2}$ equation

$$\frac{x}{4} = \frac{x+6}{12}$$

$$12x = 4(x+6)$$

$$12x = 4x + 24$$

$$8x = 24$$

$$x = 3$$

Directions: Solve each equation. Check for extraneous solutions.

7. $\frac{4}{x} + \frac{3}{4} = \frac{10}{x}$

$$\frac{4(4) + 3(x)}{4x} = \frac{10}{x}$$

$$(16 + 3x)(x) = 4x(10)$$

$$3x^2 + 16x = 40x$$

$$3x^2 - 24x = 0$$

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

$$3x = 0 \quad x-8 = 0$$

$$x = 0 \quad x = 8$$

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

$$4(x-2) = 5(x-1)$$

$$4x-8 = 5x-5$$

$$-1x-8 = -5$$

$$-1x = 3$$

$$x = -3$$

9. $\frac{9}{x} + 2 = \frac{2x}{x+3}$

$$\frac{9+2x}{x} = \frac{2x}{x+3}$$

$$(2x+9)(x+3) = 2x^2$$

$$2x^2 + 6x + 9x + 27 = 2x^2$$

$$15x + 27 = 0$$

$$15x + 27 = 0$$

$$15x = -27$$

$$x = -1.8$$

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

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

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

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

$$-3x^2 \quad -3x^2$$

$$9x + 6 = 0$$

$$9x = -6$$

$$x = -2/3$$

11. $\frac{3}{x+2} - \frac{5}{x} = \frac{13}{x+2}$

$$\frac{3x - 5(x+2)}{x(x+2)} = \frac{13x}{(x+2)(x)}$$

$$3x - 5x - 10 = 13x$$

$$-2x - 10 = 13x$$

$$-10 = 15x$$

$$x = -2/3$$

12. $\frac{7}{x} - \frac{2}{x-3} = \frac{6}{x}$

$$\frac{7(x-3) - 2(x)}{x(x-3)} = \frac{6(x-3)}{x(x-3)}$$

$$7x - 21 - 2x = 6x - 18$$

$$5x - 21 = 6x - 18$$

$$-1x - 21 = -18$$

$$-1x = 3$$

$$x = -3$$

$$13. \frac{3}{2} + \frac{2}{2x-4} = \frac{1}{x-2}$$

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

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

$$3x - 4 = 2$$

$$3x = 6$$

$$x = 2$$

No solution

$$15. \frac{x}{3x+12} + \frac{x-1}{x+4} = \frac{5}{3}$$

$$\frac{x + 3(x-1)}{3(x+4)} = \frac{5}{3}$$

$$\frac{x + 3x - 3}{3x + 12} = \frac{5}{3}$$

$$3(4x - 3) = 5(3x + 12)$$

$$12x - 9 = 15x + 60$$

$$-3x = 69$$

$$x = -23$$

$$17. \frac{1}{x-2} - \frac{2}{x+2} = \frac{2}{x^2-4}$$

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

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

$$-1x + 6 = 2$$

$$-1x = -4$$

$$x = 4$$

$$19. \frac{x}{x-3} - 2 = \frac{3}{x-3}$$

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

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

$$-1x + 6 = 3$$

$$-1x = -3$$

$$x = 3$$

No solution

$$14. \frac{2}{x-1} + \frac{5}{2x-2} = \frac{3}{4}$$

$$\frac{2(2) + 5}{2(x-1)} = \frac{3}{4}$$

$$\frac{9}{2x-2} = \frac{3}{4}$$

$$36 = 3(2x-2)$$

$$36 = 6x - 6$$

$$42 = 6x$$

$$x = 7$$

$$16. \frac{x+1}{x-2} - \frac{x+3}{x} = \frac{6}{x^2-2x}$$

$$\frac{x(x+1) - (x+3)(x-2)}{x(x-2)} = \frac{6}{x(x-2)}$$

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

$$x^2 + 1x - x^2 - 1x + 6 = 6$$

$$6 = 6$$

∞ many solutions

$$x \neq 0, 2$$

$$18. \frac{1}{x+4} + \frac{1}{x-4} = \frac{12}{x^2-16}$$

$$\frac{(x-4) + (x+4)}{(x+4)(x-4)} = \frac{12}{(x-4)(x+4)}$$

$$2x = 12$$

$$x = 6$$

$$20. \frac{x}{x-5} + 2 = \frac{5}{x-5}$$

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

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

$$3x = 15$$

$$x = 5$$

No solution