Math 3 Name: Key

Unit 5 Day 6 Notes – Solving Rational Equations Date:_____

How to Solve Rational Equations

1. Find a common denominators on each side of the equation
2. Simplify each side into one term, and then cross multiply.
3. Solve for the variable.
4. Check your answers

Example 1: Solve $\frac{y}{5}+\frac{y}{2}=7$ LCD: 10

$2y + 5y = 70$

$\frac{7y}{7} = \frac{70}{7}$

$y = 10$

Example 2: Solve $\frac{3x-2}{12}-\frac{1}{6}=\frac{1}{6}$ LCD: 12

$3x-2-2 = 2$

$3x = 6$

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

Example 3: Solve $\frac{11}{3x}-\frac{1}{3}=\frac{-4}{x^2}$ LCD: $3x^2$

Restrictions: $x \neq 0$

$11x - x^2 = -12$

$+x^2 \quad -11x$

$x^2 - 11x - 12 = 0$

-12, -12, 1, -11 ← change signs

$x=12$, $x=-1$

Example 4: Solve $\frac{5}{2x}-\frac{2}{3}=\frac{1}{x}+\frac{5}{6}$ LCD: $6x$

Restrictions: $x \neq 0$

$15 - 4x = 6 + 5x$

$-5x \quad -5x$

$15 - 9x = 6$

$-15 \quad -15$

$\frac{-9x}{-9} = \frac{-9}{-9}$ $x=1$

Example 5: Solve $x+\frac{6}{x}=-5$ LCD: x

Restrictions: $x \neq 0$

$x^2 + 6 = -5x$

$+5x \quad +5x$

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

6, 3, 2, 5 ← change signs

$x=-3$, $x=-2$

Example 6: Solve $\frac{5x-2}{x-4}=-3$ LCD: $x-4$

Restrictions: $x \neq 4$

$5x - 2 = -3(x-4)$

$5x - 2 = -3x + 12$

$+3x \quad +3x$

$8x = 12$

$+2 \quad +2$

$\frac{8x}{8} = \frac{14}{8}$ $x = \frac{7}{4}$

Directions: Simplify each rational expression. State all restrictions.

1. $\dfrac{8x^2-10x+3}{6x^2+3x-3}$

2. $\dfrac{5x}{2y+4}-\dfrac{6}{y^2+2y}$

3. $\dfrac{x^2-16}{2x+8}\div\dfrac{(x-4)^2}{8x-32}$

4. $3x-\dfrac{x^2-5x}{x^2-2}$

5. $\dfrac{3x-6}{5x-20}\cdot\dfrac{x-8}{5x-10}$

6. $\dfrac{y^2-25}{y^2-16}\div\dfrac{2y+10}{y^2-4y}$

7. $\dfrac{8}{3x^3y}+\dfrac{4}{9xy^3}$

8. $\dfrac{x^2}{x^2+2x+1}\div\dfrac{3x}{x^2-1}$

9. $\dfrac{7}{5y+25}-\dfrac{4}{3y+15}$

Directions: Solve each equation. Check your solutions.

10. $\left(\dfrac{x}{3}+\dfrac{x}{2}=10\right)^{6}$ LCD: 6

$2x+3x=60$

$\frac{5x}{5}=\frac{60}{5}$

$x=12$

11. $\dfrac{-2}{x^2-2}=\dfrac{2}{x-4}$ Restrictions: $x\neq 4$, $x\neq\pm\sqrt{2}$

$2x^2-4=-2x+8$

$+2x-8 \quad +2x+8$

$\frac{2x^2}{2}+\frac{2x}{2}-\frac{12}{2}=\frac{0}{2}$

$x^2+x-6=0$

$3\cdot -2=-6$

$x=-3,\ x=2$

12. $\left(\dfrac{1}{2x}-\dfrac{2}{5x}=\dfrac{1}{2}\right)^{10x}$ LCD: $10x$

$5-4=5x$

$\frac{1}{5}=\frac{5x}{5}$

$x=\frac{1}{5}$

13. $\dfrac{-3}{x-1}=\dfrac{-2}{x+1}$ Restrictions: $x\neq 1$, $x\neq -1$

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

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

$+3x \quad +3x$

$x=-5$

14. $\left(\dfrac{1}{x}-\dfrac{1}{6}=\dfrac{4}{3x^2}\right)^{6x^2}$ LCD: $6x^2$ Restrictions: $x\neq 0$

$6x-x^2=8$

$x^2-6x+8=0$

$8\cdot 1=8$, $-4-2=-6$ ← change signs

$x=4,\ x=-2$

15. $\dfrac{x+3}{x^2+3x-4}=\dfrac{x+2}{x^2-16}$

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

$(x+3)(x-4)=(x+2)(x-1)$

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

$-12\neq -2$