Worksheet 4.4

Solving Rational Equations – Math 3

Solve. Check for extraneous solutions.

1. $\frac{9}{3x} = \frac{4}{x+2}$ $x \neq 0, -2$

$9(x+2) = 4(3x)$

$9x + 18 = 12x$

$-9x \quad -9x$

$\frac{18}{3} = \frac{3x}{3}$

$x = 6$

2. $\frac{8}{3x-2} = \frac{2}{x-1}$ $x \neq \frac{2}{3}, 1$

$8(x-1) = 2(3x-2)$

$8x - 8 = 6x - 4$

$-6x \quad +8 \quad -6x \quad +8$

$\frac{2x}{2} = \frac{4}{2}$

$x = 2$

3. $\frac{x-3}{x+5} = \frac{x}{x+2}$ $x \neq -5, -2$

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

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

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

$5x = -x - 6$

$+x \quad +x$

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

$x = -1$

4. $\frac{4(x-4)}{x^2+2x-8} = \frac{4}{x+4}$ $x \neq -4, 2$

$(x+4)(x-2)$

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

$\frac{4(x^2+2x-8)}{4} = \frac{4(x^2-16)}{4}$

$x^2 + 2x - 8 = x^2 - 16$

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

$+16 \quad +16$

$2x + 8 = 0 \rightarrow 2(x+4) = 0$

$x = -4$

No Solution

5. $\frac{2 \cdot 2}{2 \cdot (3x)} + \frac{1x}{6x} = \frac{4(2)}{3x(2)}$ $x \neq 0$

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

$4 + x = 8$

$-4 \quad -4$

$x = 4$

6. $\frac{(x+7)1}{(x+7)2x} + \frac{3(2x)}{x+7(2x)} = \frac{-1(2)(x+7)}{x(2)(x+7)}$ $x \neq 0, -7$

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

$x + 7 + 6x = -2x - 14$

$7x + 7 = -2x - 14$

$+2x \quad -7 \quad +2x \quad -7$

$\frac{9x}{9} = \frac{-21}{9}$

$x = -\frac{21}{9} = -\frac{7}{3}$

$\frac{-2+\sqrt{316}}{6}$ and $\frac{-2-\sqrt{316}}{6}$

$\frac{-2\pm\sqrt{316}}{6}$

$=$

$\frac{-2\pm\sqrt{(2)^2-4(3)(-26)}}{2(3)}$

7. $\frac{5}{x^2+x-6}=\frac{2}{1}+\frac{(x-3)(x+3)}{x-2}$ $\quad x\neq -3,2$

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

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

$5=2(x^2+x-6)+(x^2-9)$

$5=2x^2+2x-12+x^2-9$

$5=3x^2+2x-21$

$-5 \quad -5$

$3x^2+2x-26$

≈ 2.629

≈ -3.296

8. $\frac{x}{x-3}\cdot\frac{2}{x}+\frac{1}{x}=\frac{x-1}{x-3}\cdot\frac{(x)}{(x)}$ $\quad x\neq 0,3$

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

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

$3x-3=x^2-x$

$-3x+3 \quad -3x+3$

$0=x^2-4x+3$

$(x-3)(x-1)$

$x=3,1$

$x=1$

9. $\frac{10}{x}+\frac{3}{1}=\frac{x+9}{x-4}$ $\quad x\neq 0,4$

$\frac{10(x-4)}{x(x-4)}+\frac{3x(x-4)}{x(x-4)}=\frac{x(x+9)}{x(x-4)}$

$10x-40+3x^2-12x = x^2+9x$

$-x \qquad\qquad -x^2$

$10x-40+2x^2-12x = 9x$

$2x^2-2x-40 = 9x$

$-9x \qquad -9x$

$2x^2-11x-40=0$

$\frac{-(-11)\pm\sqrt{(-11)^2-4(2)(-40)}}{2(2)}$

$\frac{11\pm\sqrt{121+320}}{4}=\frac{11\pm\sqrt{441}}{4}$

$\frac{11\pm 21}{4}$ $\quad \frac{11+21}{4}=8$ $\quad \frac{11-21}{4}=-2.5$

10. $\frac{x+3}{x-3}+\frac{x}{x-5}=\frac{x+5}{x-5}$ $\quad x\neq 3,5$

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

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

$2x^2-5x-15 = x^2+2x-15$

$-x^2-2x+15 \quad -x^2-2x+15$

$x^2-7x=0$

$x(x-7)=0$

$x=0$, $\quad x-7=0$

$x=7$