

1.4 Rational Equations WS 2

Name Key

Solve the rational equation, be sure to check your solutions.

1. $\left(\frac{4}{x+3} + \frac{5}{6} = \frac{23}{18}\right) 18(x+3)$

$$4(18) + 5(3)(x+3) = 23(x+3)$$

$$72 + 15x + 45 = 23x + 69$$

$$15x + 117 = 23x + 69$$

$$\begin{array}{r} -15x \quad -69 \quad -15x \quad -69 \\ \hline \end{array}$$

$$48 = 8x$$

$$x = 6$$

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

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

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

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

$$x - 3 = -2$$

$$x = 1$$

No Solution

3. $\frac{-4x}{x-1} + \frac{4}{x+1} = \frac{-8}{x^2-1}$

$$\frac{-4x}{x-1} + \frac{4}{x+1} = \frac{-8}{(x+1)(x-1)}$$

$$-4x(x+1) + 4(x-1) = -8$$

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

$$\begin{array}{r} -4x^2 - 4 = -8 \\ +4 \quad +4 \\ \hline \end{array}$$

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

$$\sqrt{x^2} = \sqrt{1}$$

$$x = \pm 1$$

No Solution

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

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

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

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

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

$$3x(x+1) = 0$$

$$x = 0, -1$$

$$x = -1$$

5. $\left(\frac{7}{12} + \frac{9}{x-4} = \frac{55}{48}\right) 48(x-4)$

$$7(4)(x-4) + 9(48) = 55(x-4)$$

$$28x - 112 + 432 = 55x - 220$$

$$28x + 320 = 55x - 220$$

$$\begin{array}{r} -28x + 220 \quad -28x + 220 \\ \hline \end{array}$$

$$\frac{540}{27} = \frac{27x}{27}$$

$$x = 20$$

6. $\frac{1}{x-2} + \frac{2x+1}{x^2+2x-8} = \frac{2}{x+4}$

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

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

$$3x+5 = 2x-4$$

$$x = -9$$

Solve the polynomial equation.

7. $3x^4 + 8x^2 - 3 = 0 \quad u = x^2$

$$3u^2 + 8u - 3 = 0$$

$$\frac{3u}{-1} \quad \frac{3u}{9} \quad \begin{matrix} -9 \\ \wedge \\ 9-1 \end{matrix}$$

$$(3x^2 - 1)(x^2 + 3) = 0$$

$$\begin{aligned} 3x^2 - 1 = 0 & \quad x^2 + 3 = 0 \\ 3x^2 = 1 & \quad \sqrt{x^2} = \sqrt{-3} \\ \sqrt{x^2} = \sqrt{\frac{1}{3}} & \quad x = \pm i\sqrt{3} \\ x = \pm \frac{\sqrt{3}}{3} & \end{aligned}$$

$$x = \frac{\pm\sqrt{3}}{3}, \pm i\sqrt{3}$$

8. $2x^3 - 4x^2 - 3x = -6$

$$2x^3 - 4x^2 - 3x + 6 = 0$$

$$2x^2(x-2) - 3(x-2) = 0$$

$$(2x^2 - 3)(x-2) = 0$$

$$2x^2 - 3 = 0 \quad x - 2 = 0$$

$$2x^2 = 3 \quad x = 2$$

$$\sqrt{x^2} = \sqrt{\frac{3}{2}}$$

$$x = \pm \frac{\sqrt{6}}{2}$$

$$x = 2, \pm \frac{\sqrt{6}}{2}$$

9. $2x^2 + 21x + 27 = 0$

$$\begin{matrix} 54 \\ \wedge \\ 318 \\ \frac{2}{2} \end{matrix}$$

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

10. $x^{\frac{2}{3}} - 6x^{\frac{1}{3}} - 16 = 0 \quad u = x^{\frac{1}{3}}$

$$u^2 - 6u - 16 = 0$$

$$(x^{\frac{1}{3}} - 8)(x^{\frac{1}{3}} + 2) = 0$$

$$(x^{\frac{1}{3}})^3 = (8)^3 \quad (x^{\frac{1}{3}})^3 = (-2)^3$$

$$x = -8, 512$$

11. $x^3 - 27 = 0$

$$(x-3)(x^2 + 3x + 9) = 0$$

$$\frac{-3 \pm \sqrt{9 - 4(1)(9)}}{2}$$

$$\frac{-3 \pm \sqrt{-27}}{2}$$

$$\frac{-3 \pm 3i\sqrt{3}}{2}$$

$$x = 3, \frac{-3 \pm 3i\sqrt{3}}{2}$$

12. $4x^{\frac{2}{3}} - 9 = 9x^{\frac{1}{3}}$

$$4x^{\frac{2}{3}} - 9x^{\frac{1}{3}} - 9 = 0 \quad u = x^{\frac{1}{3}}$$

$$4u^2 - 9u - 9 = 0$$

$$\frac{4u}{3} \quad \frac{4u}{-12} \quad \begin{matrix} -36 \\ \wedge \\ -12 \cdot 3 \end{matrix}$$

$$4x^{\frac{1}{3}} + 3 = 0 \quad x^{\frac{1}{3}} - 3 = 0$$

$$(x^{\frac{1}{3}})^3 = \left(-\frac{3}{4}\right)^3 \quad (x^{\frac{1}{3}})^3 = (3)^3$$

$$x = \frac{-27}{64}$$

$$x = 27$$

$$x = \frac{-27}{64}, 27$$