

3A Assignment: Rational Expressions and Equations

Answer the following problems with as much detail, explanation, and work that is appropriate.

Simplify by canceling first.

1. $\frac{25}{12} \cdot \frac{18}{10} \cdot \frac{8}{35}$

$$\frac{25}{12} \cdot \frac{18}{10} \cdot \frac{8}{35} = \frac{\cancel{5} \cdot \cancel{5}}{\cancel{2} \cdot \cancel{2} \cdot \cancel{3}} \cdot \frac{\cancel{2} \cdot \cancel{3} \cdot \cancel{3}}{\cancel{2} \cdot \cancel{5}} \cdot \frac{\cancel{2} \cdot \cancel{2} \cdot \cancel{2}}{\cancel{5} \cdot \cancel{7}} = \frac{6}{7}$$

2. $\frac{x^2+2x-3}{x+1} \cdot \frac{x^2+2x+1}{x+3} \cdot \frac{5}{x^2-1}$

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

Simplify the expression by finding a common denominator.

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

$$\frac{x \cdot x(x-2)}{3x(x-2)} + \frac{5 \cdot 3(x-2)}{3x(x-2)} - \frac{2 \cdot 3x}{3x(x-2)} = \frac{x^3 - 2x^2 + 15x - 30 - 6x}{3x(x-2)} = \frac{x^3 - 2x^2 + 9x - 30}{3x^2 - 6x}$$

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

$$\frac{3x^2 - 7x}{x^2 - 4}$$

Solve these rational equations.

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

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

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

$$x^2 + 2x = x + 4$$

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

$$x = \frac{-1 \pm \sqrt{17}}{2}$$

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

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

$$x = \frac{-\sqrt{85} - 7}{6} \text{ or } x = \frac{\sqrt{85} - 7}{6}$$

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

$$2(x-2) = 1 \cdot 3 + 1 \cdot x$$

$$x = 7$$

$$8. \frac{x}{5} = \frac{1}{x+1} + \frac{1}{x^2+x}$$

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

$$\frac{x^2(x+1)}{5x(x+1)} = \frac{5x}{5x(x+1)} + \frac{5}{5x(x+1)}$$

$$x^2(x+1) = 5x + 5$$

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

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

$$(x+1)(x^2 - 5) = 0$$

$$x = -1 \text{ or } x = \sqrt{5} \text{ or } x = -\sqrt{5}$$

By domain restriction, $x \neq -1$

Solution: $x = \sqrt{5}$ or $x = -\sqrt{5}$

$$9. \frac{x(x^2-2)}{(x^2+3)} - \frac{1}{2} = \frac{1}{x(x^2+3)}$$

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

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

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

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

$x = 2$ or $x = -1$ or $x = -\frac{1}{4} \pm \frac{\sqrt{7}}{4}i$