

7.5 Practice - Complex Fractions

Solve.

$$1) \frac{1 + \frac{1}{x}}{1 - \frac{1}{x^2}}$$

$$3) \frac{a-2}{\frac{4}{a}-a}$$

$$5) \frac{\frac{1}{a^2} - \frac{1}{a}}{\frac{1}{a^2} + \frac{1}{a}}$$

$$7) \frac{2 - \frac{4}{x+2}}{5 - \frac{10}{x+2}}$$

$$9) \frac{\frac{3}{2a-3} + 2}{\frac{-6}{2a-3} - 4}$$

$$11) \frac{\frac{x}{x+1} - \frac{1}{x}}{\frac{x}{x+1} + \frac{1}{x}}$$

$$13) \frac{\frac{3}{x}}{\frac{9}{x^2}}$$

$$15) \frac{\frac{a^2-b^2}{4a^2b}}{\frac{a+b}{16ab^2}}$$

$$17) \frac{1 - \frac{3}{x} - \frac{10}{x^2}}{1 + \frac{11}{x} + \frac{18}{x^2}}$$

$$19) \frac{1 - \frac{2x}{3x-4}}{x - \frac{32}{3x-4}}$$

$$21) \frac{x-1 + \frac{2}{x-4}}{x+3 + \frac{6}{x-4}}$$

$$2) \frac{\frac{1}{y^2} - 1}{1 + \frac{1}{y}}$$

$$4) \frac{\frac{25}{a} - a}{5 + a}$$

$$6) \frac{\frac{1}{b} + \frac{1}{2}}{\frac{4}{b^2-1}}$$

$$8) \frac{4 + \frac{12}{2x-3}}{5 + \frac{15}{2x-3}}$$

$$10) \frac{\frac{-5}{b-5} - 3}{\frac{10}{b-5} + 6}$$

$$12) \frac{\frac{2a}{a-1} - \frac{3}{a}}{\frac{-6}{a-1} - 4}$$

$$14) \frac{\frac{x}{3x-2}}{\frac{x}{9x^2-4}}$$

$$16) \frac{1 - \frac{1}{x} - \frac{6}{x^2}}{1 - \frac{4}{x} + \frac{3}{x^2}}$$

$$18) \frac{\frac{15}{x^2} - \frac{2}{x} - 1}{\frac{4}{x^2} - \frac{5}{x} + 4}$$

$$20) \frac{1 - \frac{12}{3x+10}}{x - \frac{8}{3x+10}}$$

$$22) \frac{x-5 - \frac{18}{x+2}}{x+7 + \frac{6}{x+2}}$$

Solve

Rational Expressions - Proportions

Objective: Solve proportions using the cross product and use proportions to solve application problems

When two fractions are equal, they are called a proportion. This definition can be generalized to two equal rational expressions. Proportions have an important property called the cross-product.

Cross Product: If $\frac{a}{b} = \frac{c}{d}$ then $ad = bc$

The cross product tells us we can multiply diagonally to get an equation with no fractions that we can solve.

Example 359.

$$\frac{20}{6} = \frac{x}{9} \quad \text{Calculate cross product}$$

$$\text{LCD} = (x+3)(x-3) \quad \text{Multiply each term by LCD}$$

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

Reduce fractions

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

FOIL

$$\frac{x^2 - 6x + 9 - x^2 - 6x - 9}{x^2 - 6x + 9 + x^2 + 6x - 9}$$

Combine like terms

$$\frac{-12x}{2x^2 + 18}$$

Factor out 2 in denominator

$$\frac{-12x}{2(x^2 + 9)}$$

Divide out common factor 2

$$\frac{-6x}{x^2 - 9}$$

Our Solution

If there are negative exponents in an expression we will have to first convert these negative exponents into fractions. Remember, the exponent is only on the factor it is attached to, not the whole term.

Example 358.

$$\frac{m^{-2} + 2m^{-1}}{m + 4m^{-2}}$$

Make each negative exponent into a fraction

$$\frac{\frac{1}{m^2} + \frac{2}{m}}{m + \frac{4}{m^2}}$$

Multiply each term by LCD, m^2

$$\frac{\frac{1(m^2)}{m^2} + \frac{2(m^2)}{m}}{m(m^2) + \frac{4(m^2)}{m^2}}$$

Reduce the fractions

$$\frac{1 + 2m}{m^3 + 4}$$

Our Solution

Once we convert each negative exponent into a fraction, the problem solves exactly like the other complex fraction problems.