Rational Expressions

***A* rational expression** is the quotient P/Q of two polynomials P and Q as long as Q is not 0.

A rational function is a function described by a rational expression.

To simplify a rational expression:
1. Completely factor the numerator and the denominator.
2. Apply the fundamental principle.

To multiply rational expressions:
1. Completely factor numerators and denominators.
2. Multiply the numerators and multiply the denominators.
3. Apply the fundamental principle.

To divide rational expressions: Multiply the first rational expression by the reciprocal of the second rational expression.

To add or subtract rational expressions:

1. Find the LCD.
2. Write each rational expression as an equivalent rational expression whose denominator is the LCD.
3. Add or subtract numerators and write the sum or difference over the common denominator.
4. Write the result in lowest terms.

Simplifying Complex Fractions

Method I: Simplify the numerator and the denominator so that each is a single fraction. Then perform the indicated division and simplify if possible.

Method II: Multiply the numerator and the denominator of the complex fraction by the LCD of the fractions in both the numerator and the denominator. Then simplify.

Dividing Polynomials

To divide a polynomial by a monomial: Divide each term in the polynomial by the monomial.

To divide a polynomial by a polynomial, other than a monomial: Use **long division.** A shortcut method called **synthetic division** may be used to divide a polynomial by a binomial of the form x - c.

Solving Equations Containing Rational Expressions

Multiply both sides of the equation by the LCD of all rational expressions. Then apply the distributive property and simplify. Solve the resulting equation and then check each proposed solution to see whether it makes the denominator 0. If so, it is an **extraneous solution.**

Variation and Problem Solving

Y varies directly as x, or y is directly proportional to **x,** if there is a nonzero constant k such that y = kx.

Y varies inversely as x, or y is inversely proportional to x, if there is a nonzero constant k such that y = k/x.