

Simplifying Rational Expressions
§11.3

Rational Expression – an algebraic fraction whose numerator and denominator are polynomials.

Since division by zero is undefined, the polynomial in the denominator cannot be 0

State the excluded value for each rational expression.

Example 1

$$\frac{3b - 2}{b + 7}$$

Example 2

$$\frac{5a^2 + 2}{a^2 - a - 12}$$

Simplify and state the excluded values of x .

Example 3

$$\frac{32x^5 y^2}{4xy^7}$$

Example 4

$$\frac{4x + 16}{x^2 - 5x - 36}$$

Example 5

$$\frac{x^2 - 25}{8x - 40}$$

Example 6

$$\frac{x^2 - 2x - 15}{x^2 - 7x + 10}$$

Find the zeros

Example 7

$$\frac{x^2 + 8x + 7}{x + 1}$$

Example 8

$$\frac{x^2 - 2x - 8}{x^2 + 2x - 24}$$

Multiplying and Dividing Rational Expressions
§11.4

Find each product.

Example 1

$$\frac{7x^2y}{12z^3} \cdot \frac{14z}{49xy^4}$$

Example 2

$$\frac{4x + 16}{x^2 - 5x - 36}$$

Find each quotient.

Example 3

$$\frac{8}{20x^3} \div \frac{44}{25x^2}$$

Example 4

$$\frac{3x + 9}{x^2} \div x + 3$$

Find each quotient.

Example 5

$$\frac{y - 6}{2y + 6} \div \frac{y + 2}{y + 3}$$

Example 6

$$\frac{y - 5}{y^2 - 9y + 18} \div \frac{y^2 - 25}{y - 6}$$

Dividing Polynomials
§11.5

Dividing Polynomials by MONOMIALS

1 way:

Example 1

$$\frac{4x^2 - 18x}{2x}$$

Example 2

$$(2y^2 - 3y - 9) \div 3y$$

Dividing Polynomials by a BINOMIAL

3 ways: 1. Factoring 2. Long Division 3. Synthetic Division (Alg 2)

Example 3

$$(2r^2 + 5r - 3) \div (r + 3)$$

Example 4

$$(y^2 + 7y - 15) \div (y - 2)$$

Example 5

$$(x^3 - 34x + 45) \div (x - 5)$$

Adding and Subtracting Rational Expressions
§11.6

Adding/Subtracting Rational Expressions with Like Denominators

$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c} \quad \text{OR} \quad \frac{a}{c} - \frac{b}{c} = \frac{a-b}{c}$$

Example 1

$$\frac{4b}{15} + \frac{6b}{15}$$

Example 2

$$\frac{7x+9}{x-3} - \frac{x-5}{x-3}$$

Example 3

$$\frac{3x}{11-x} + \frac{-5x}{x-11}$$

Least Common Multiple (LCM) – the least number that is a multiple of two or more numbers or polynomials.

Find the LCM.

Example 4

$$12b^4c^5 \text{ and } 32bc^2$$

Example 5

$$x^2 - 3x - 28 \text{ and } x^2 - 8x + 7$$

Find

Example 6

$$\frac{x-5}{x+1} + \frac{x+3}{x}$$

Example 7

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

Example 8

$$\frac{x+7}{x^2-6x+9} + \frac{x+3}{x-3}$$

Mixed Expressions and Complex Fractions
§11.7

Mixed Expression – an expression containing a whole number and a rational number.

Write as a rational expression.

Example 1

$$3 + \frac{7}{x - 2}$$

Example 2

$$5 - \frac{4}{x + 3}$$

Complex Fraction – having one or more fractions in the numerator or denominator.

Simplify

Example 3

$$\frac{\frac{a^5 b}{c^2}}{\frac{ab^4}{c^4}}$$

Example 4

$$\frac{\frac{x^3 y^5}{z^6}}{\frac{x^5 y^8}{z^3}}$$

Example 5

$$\frac{b + \frac{2}{b + 3}}{b - 4}$$

Example 6

$$\frac{\frac{c^2 - 4c + 3}{c^2 + 9c + 14}}{\frac{c^2 - 9}{c + 2}}$$

Rational Equations
§11.8

Rational Equation – an equation containing one or more rational expressions.

Example 1

$$\frac{5}{x+3} = \frac{3}{x}$$

Example 2

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

Example 3

$$\frac{7}{y-3} = \frac{3}{y+1}$$

Extraneous Solutions – a solution of a rational equation which results in the denominator equaling 0.

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

Example 4

$$\frac{3x}{x-1} + \frac{6x-9}{x-1} = 6$$

Example 5

$$\frac{n^2-3n}{n^2-4} - \frac{10}{n^2-4} = 2$$