

Rational Expressions - Domain, Simplify, Multiply, Divide Video Lecture

Sections 7.1 and 7.2

Course Learning Objective:

Demonstrate appropriate manipulation of rational expressions.

Weekly Learning Objectives:

- 1) Find the domain of a rational expression.**
- 2) Simplify rational expressions.**
- 3) Write equivalent forms of rational expressions.**
- 4) Multiply and divide rational expressions.**

Rational Expressions - Finding Domains, Simplifying, Multiplying and Dividing

Rational Expression: an expression of the form $\frac{P}{Q}$ where P and Q are polynomials, $Q \neq 0$.

Rational Expressions are not necessarily defined for all values of x.

How to find the domain of a rational expression:

- 1) Factor the denominator
- 2) Set each factor of the denominator to zero
- 3) The domain will be all real numbers except the x-values that make the denominator zero.

Find the domain of:

$$\frac{4}{x+2}$$

$$\frac{6x-1}{x^2-4}$$

$$\frac{x+3}{2x^2+5x+3}$$

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

How to simplify rational expressions:

- 1) Completely factor the numerator and denominator
- 2) Cancel out common factors with a ONE and
Cancel out opposite factors with a NEGATIVE ONE
- 3) The answer will be the product of the remaining factors

Reduce to lowest terms:

$$\frac{5s - 25}{s^2 - 25}$$

$$\frac{6t^2 - 6t}{2t - 2}$$

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

$$\frac{x^2 + x - 6}{4 - x^2}$$

$$\frac{x - 2}{x - 2}$$

$$\frac{x + 2}{2 + x}$$

$$\frac{x - 2}{2 - x}$$

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

$$\frac{(a+b)^2}{a^2 - 2ab - 3b^2}$$

$$\frac{8x + 16 - px - 2p}{px - 2p - 8x + 16}$$

How to multiply or divide rational expressions:

- 1) If dividing, first change division to multiplication by the reciprocal
- 2) Completely factor all numerators and denominators
- 3) Cancel out common factors to ONE's
Cancel our opposite factors to NEGATIVE ONE's
- 4) The answer is the product of the remaining factors

Multiply or divide:

$$\frac{12x - 20}{5x} \cdot \frac{6x^2}{9x - 15}$$

$$\frac{z^2 - 3z + 2}{z^2 + 4z + 3} \div \frac{1 - z}{z + 1}$$

$$\frac{(x+1)^3(x+4)}{x^2+5x+4} \div \frac{x^2+2x+1}{x^2+3x+2}$$

$$\frac{x^3-125}{2x+1} \div \frac{x^2-25}{2x^2-9x-5}$$