

## 6.1 Rational Expressions - Day 1

**Objectives** To simplify rational expressions  
To multiply and divide rational expressions

Definition:

### Rational Expression:

A **rational expression** is the quotient of two polynomials. You will find that, at different times, it is helpful to think of rational expressions as ratios, as fractions, or as quotients.

Ex.  $\frac{x^2 + 7x + 10}{x + 2}$        $\frac{3x^2 y}{12y}$        $\frac{1}{x^2 - 9}$

### Simplest Form:

A rational expression is in **simplest form** when its numerator and denominator are polynomials that have no common divisors.

*"After we factor and cancel"*

What is  $\frac{x^2 + 7x + 10}{x^2 - 3x - 10}$  in simplest form? State any restrictions on the variable.

$$= \frac{(x+5)\cancel{(x+2)}}{(x-5)\cancel{(x+2)}}$$

$$= \boxed{\frac{x+5}{x-5}}$$

**STEPS:**

1. Factor
2. State Restrictions on any denominators.
3. Cancel like terms and factors.  
Left over is simplest form.

$x \neq 5, -2$

What is the rational expression in simplest form? State any restrictions on the variables.

$$\frac{-18x^3y^2z^2}{24x^2y^3z^7}$$

$x, y, z \neq 0$

$$= \frac{-3x}{4yz^5}$$
  

$$\frac{9x^2 - 25}{6x^2 - 7x - 5}$$

$$= \frac{(3x+5)(3x-5)}{(2x+1)(3x-5)}$$

$x \neq -\frac{1}{2}, \frac{5}{3}$

$$= \frac{3x+5}{2x+1}$$

What is the product  $\frac{2x - 8}{x^2 - 16} \cdot \frac{x^2 + 5x + 4}{x^2 + 8x + 16}$  in simplest form? State any restrictions on the variable.

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

$x \neq -4, 4$

$$= \frac{2(x+1)}{(x+4)(x+4)}$$

What is the quotient  $\frac{x^2 + 5x + 4}{x^2 + x - 12} \div \frac{x^2 - 1}{2x^2 - 6x}$  in simplest form? State any restrictions on the variable.

*"multiply by recip."*

$$= \frac{\cancel{(x+4)}\cancel{(x+1)}}{\cancel{(x+4)}\cancel{(x-3)}} \cdot \frac{2x\cancel{(x-3)}}{\cancel{(x+1)}(x-1)}$$

$x \neq -4, 3, -1, 1, 0$

$$= \frac{2x}{x-1}$$

What is the quotient  $\frac{2-x}{x^2 + 2x + 1} \div \frac{x^2 + 3x - 10}{x^2 - 1}$  in simplest form? State any restrictions on the variable.

$$= \frac{-1\cancel{(x-2)}}{(x+1)\cancel{(x+1)}} \cdot \frac{\cancel{(x+1)}(x-1)}{(x+5)\cancel{(x-2)}}$$

$x \neq -1, -5, 2, 1$

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