

6.1 Rational Expressions

algebraic fractions with numerator + denominator that are polynomials.

$$\frac{f(x)}{g(x)}$$

$$g(x) \neq 0$$

Polynomials

$$ax^n + bx^{n-1} + cx^{n-2} \dots + dx + e$$

examples:

$$\frac{m}{m+1}$$

$$\frac{x}{y}$$

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

$$x^3$$

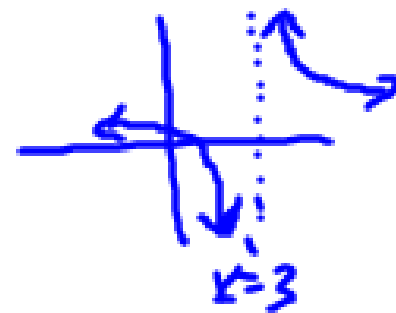
← denominator is 1

Restrictions

division by zero.

$$\text{ex: } \frac{x-7}{x-3}$$

exists for $x \neq 3$



$$\text{ex: } \frac{x-7}{x^2-9} = \frac{x-7}{(x-3)(x+3)}$$

so it exists for $x \neq \pm 3$

$$\text{ex: } \frac{x-7}{x^2-4x+3} = \frac{x-7}{(x-1)(x-3)}$$

... exists for $x \neq 1, 3$

$$\text{ex: } \frac{6-x}{2x} \quad x \neq 0$$

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Example 1

Determine Non-Permissible Values

For each rational expression, determine all non-permissible values.

a) $\frac{5t}{4sr^2}$

\uparrow
 $4sr^2 \neq 0$

$\therefore s \neq 0$

$r \neq 0$

b) $\frac{3x}{x(2x-3)}$

\uparrow
 $x \neq 0 \quad x \neq \frac{3}{2}$

OR

$x \neq 0, \frac{3}{2}$

c) $\frac{2p-1}{p^2-p-12}$

$p^2 - p - 12 \neq 0$
 $(p-4)(p+3) \neq 0$

$p \neq 4, -3$

Simplifying Rational Expressions

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Example 2

Simplify a Rational Expression

Simplify each rational expression.
State the non-permissible values.

a) $\frac{3x - 6}{2x^2 + x - 10}$

FACTOR

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

REDUCING

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

$x \neq -5/2, 2$

b) $\frac{1-t}{t^2-1}$

$$\frac{1-t}{(t+1)(t-1)} = \frac{-(t-1)}{(t+1)(t-1)}$$

$$\frac{-1}{t+1}$$

$t \neq \pm 1$

* $\frac{a-b}{b-a} = -1$

$$\frac{a-b}{-1(a-b)} = \frac{1}{-1}$$

Example 3

Rational Expressions With Pairs of Non-Permissible Values

Consider the expression $\frac{16x^2 - 9y^2}{8x - 6y}$.

- a) What expression represents the non-permissible values for x ?
- b) Simplify the rational expression.
- c) Evaluate the expression for $x = 2.6$ and $y = 1.2$.
Show two ways to determine the answer.

a) $8x - 6y \neq 0$

$$8x \neq 6y$$

$$x \neq \frac{6}{8}y$$

$$x \neq \frac{3}{4}y$$

$$y \neq \frac{4}{3}x$$

b) * difference of squares $a^2 - b^2$
 $(a+b)(a-b)$

$$\frac{(4x-3y)(4x+3y)}{2(4x-3y)}$$

$$2(4x-3y)$$

$$\frac{4x+3y}{2}$$

c) $\frac{4(2.6) + 3(1.2)}{2}$

$$= 7$$

Today: 1-15 pgs.317-318
Monday: 16-26 pgs.318-320