

15.1 Multiplying and Simplifying Rational Expressions

Rational Expression

$$\frac{3}{4}, \quad \frac{x}{y}, \quad \frac{9}{a+b}, \quad \frac{x^2 + 7xy - 4}{x^3 - y^3}, \quad \frac{1 + z^3}{1 - z^6}$$

When a variable is replaced with a number that makes the denominator 0, the rational expression is undefined.

To determine which numbers make the rational expression undefined, set the *denominator* = 0 and solve for the variable.

Ex. Find all numbers for which each rational expression is undefined.

(a) $\frac{14}{-5y}$

(b) $\frac{x^2 - 9}{4x - 12}$

(c) $\frac{p^2 - 9}{p^2 - 7p + 10}$

(d) $\frac{7 - 3x + x^2}{49 - x^2}$

❖ SIMPLIFYING RATIONAL EXPRESSIONS

Ex. Simplify: (factor & remove a factor equal to 1)

(a) $\frac{3m^2 + 3m}{6m^2 + 9m}$

(b) $\frac{t^2 - 9}{5t + 15}$

(c) $\frac{2t^2 - 6t + 4}{4t^2 + 12t - 16}$

(d) $\frac{49 - a^2}{a - 7}$

Exercises

Simplify:

(a) $\frac{8y^5}{4y^9}$

(b) $\frac{4y - 20}{4y + 12}$

(c) $\frac{6 - 5a}{10a - 12}$

(d) $\frac{a^2 - 4}{a^2 + 5a + 6}$

❖ MULTIPLICATION

Recall: $\frac{3}{5} \cdot \frac{15}{8}$

Multiplying Rational Expressions:

- 1) Factor each numerator and denominator.
- 2) Find all common factors to reduce.
- 3) Multiply straight across.

$$\frac{P}{Q} \cdot \frac{R}{S} = \frac{PR}{QS}$$

Ex. Multiply and, if possible, simplify.

(a) $\frac{x^2 + 10x - 11}{5x} \cdot \frac{10x^3}{x + 11}$

(b) $\frac{x + 5}{(x + 2)^2} \cdot \frac{x^2 + 7x + 10}{(x + 5)^2}$

(c) $\frac{t + 2}{t - 2} \cdot \frac{t^2 - 5t + 6}{(t + 2)^2}$

(d) $\frac{2t^2 - 98}{4t^2 - 4} \cdot \frac{8t + 8}{16t - 112}$