

Rational Expressions and Functions: Multiplying and Dividing

A **rational expression** is a _____ divided by a _____.

ex: $\frac{50x}{10-x}$ $\frac{3x+1}{x^2-3x+2}$ $\frac{x^2+3xy-10y^2}{3x^2-7xy+2y^2}$

Ex 1.

Find the domain of $f(x) = \frac{x-5}{2x^2+5x-3}$

Ex 2.

Find the domain of $f(x) = \frac{3}{x^2+1}$

To simplify a rational expression:

1. _____ top and bottom completely.
2. _____ any common factors.

Ex 3.

Simplify: $\frac{x^2+7x+10}{x+2}$

Note:

When we simplify rational expressions, we're changing the _____ of the related rational functions.

ex: The domain of $\frac{x^2+7x+10}{x+2}$ is all real #'s except -2 , but the domain of $x + 5$ is all real #'s.

So, to simplify, but also keep the original domain, we can write:

$$\frac{x^2+7x+10}{x+2} = x + 5, \text{ for } x \neq -2$$

Ex 4.

Simplify: $\frac{3x^2+9xy-12y^2}{9x^3-9xy^2}$

To multiply rational expressions:

1. _____ tops and bottoms completely.
2. _____ common factors.
3. _____ remaining factors on top and on bottom (you can leave top/bottom factored).

Ex 5.

Multiply: $\frac{x+4}{x-7} \cdot \frac{x^2-4x-21}{x^2-16}$

Ex 6.

Multiply: $\frac{4x+8}{6x-3x^2} \cdot \frac{3x^2-4x-4}{9x^2-4}$

Dividing is the same as multiplying by the _____.

Ex 7.

Divide: $\frac{x^2-x-12}{5x} \div \frac{x^2-10x+24}{x^2-6x}$

Ex 8.

Divide: $(9x^2 - 49) \div \frac{3x-7}{9}$

Practice

1. Find the domain of $\frac{x^2-2x-15}{3x^2+8x-3}$ and then simplify the rational expression.

2. Simplify: $\frac{x^2+2xy-3y^2}{2x^2+5xy-3y^2}$

3. Multiply and simplify: $\frac{x^2+4x+4}{x^2+8x+16} \cdot \frac{(x+4)^3}{(x+2)^3}$

4. Multiply and simplify: $\frac{6y+2}{y^2-1} \cdot \frac{1-y}{3y^2+y}$

5. Divide and simplify: $\frac{x^2-x}{15} \div \frac{x-1}{5}$

6. Divide and simplify: $(x^2 + 4x - 5) \div \frac{x^2-25}{x+7}$

Q: A man rode his horse into town on Tuesday. Two days later he rode home on Tuesday. How is this possible?