

## 2.1/2.2 Multiplying and Dividing Rational Expressions – Lesson

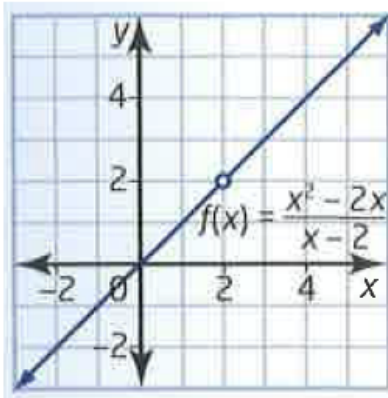
MCR3U

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### What is a Rational Expression?

***Rational Expression:***

**Example of a graph of a rational expression:**



*The open circle is used to represent a hole in the graph. This corresponds to any restrictions on the variable (denominator can't be 0).*

### Stating Restrictions

**Note:** rational expressions must be checked for restrictions by determining where the denominator is equal to \_\_\_\_\_. These restrictions must be stated when the expression is simplified.

**Example 1:** State the restrictions for the following rational expressions

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

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

c)  $\frac{5}{x(x+3)}$

**Rule:** We can cancel out **ONLY** when multiplying fractions

**Rule:** We can **NOT** cancel out when adding or subtracting fractions

### Simplifying Rational Expressions

**Example 2:** Simplifying each expression and determine any restrictions on the variable.

a)  $\frac{3x^2}{yx}$

b)  $\frac{x-3}{x^2+3x-18}$

*Note: factor where possible and then state restrictions before cancelling factors.*

c)  $\frac{x^2+10x+21}{x+3}$

d)  $\frac{x+1}{x^2+3x+2}$

$$\text{e) } \frac{x^2-9}{x^2+7x+12}$$

$$\text{f) } \frac{6x^2-7x-5}{3x^2+x-10}$$

### Multiplying Rational Expressions

$$\text{a) } \frac{4x^2}{3x} \cdot \frac{12x^3}{2x}$$

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|--|
| <ol style="list-style-type: none"><li>1. factor where possible</li><li>2. cancel common factors</li><li>3. multiply numerators and denominators</li><li>4. state restrictions (throughout process)</li></ol> |
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$$\text{b) } \frac{4x+24}{x^2+8x} \cdot \frac{12x^2}{3x+18}$$

$$\text{c) } \frac{a^2+2a}{3a} \cdot \frac{20a^2}{5a^2+10a}$$

$$\text{d) } \frac{x+1}{2x} \cdot \frac{3x}{x^2+4x+3}$$

$$\text{e) } \frac{5x^2-13x+8}{x-7} \cdot \frac{1}{5x-8}$$

### Dividing Rational Expressions

$$\text{a) } \frac{10ab^2}{4a} \div \frac{15a^2}{12b^2}$$

1. flip second fraction and change to multiplication
2. factor where possible
3. cancel common factors
4. multiply numerators and denominators
5. state restrictions (throughout process)

$$\text{b) } \frac{a^2+2a}{3a} \div \frac{5a^2+10a}{20a^2}$$

$$\text{c) } \frac{2x^2-8x}{x^2-3x-10} \div \frac{4x^2}{x^2-9x+20}$$