

Multiplying and Dividing Rationals

Part 1: Multiply

Steps for multiplying rational functions:

- Step #1 Factor
- Step #2 Cancellation Property
- Step #3 Multiply numerators
- Step #4 Multiply denominators
- Step #5 Product will always be in reduced form

Given $f(x) = \frac{x^2 - x - 2}{2x^2 - 3x - 2}$ and $g(x) = \frac{2x^2 - 5x - 3}{x^2 + x}$, try and find $f(x) \cdot g(x)$.

Step #1 Factor. $f(x)$ and $g(x)$.

Step #2 Use the cancellation property.

$$\frac{(\quad)(\quad)}{(\quad)(\quad)} \cdot \frac{(\quad)(\quad)}{(\quad)}$$

Step #3 What are the expressions remaining in the numerator?

Step #4 What are the expressions remaining in the denominator?

Step #5 Write your answer as $\frac{\text{product of numerator}}{\text{product of denominator}}$. List any excluded values.

Practice: Multiply each expression and write your answer in reduced form.

$$1. \frac{3x}{5x-15} \cdot \frac{x-3}{9x^2}$$

$$2. \frac{3ab^2}{4c} \cdot \frac{2c^2}{27ab}$$

$$3. \frac{x+5}{x^2-4x+3} \cdot \frac{x-3}{4x+20}$$

$$4. \frac{7x-7}{3x^2} \cdot \frac{x+5}{9x^2-9} \cdot \frac{x^2-5x-6}{x^3+6x^2+5x}$$

Part 2: Divide

Steps for dividing rational expressions:

- Step #1 Rewrite division problem as an equivalent multiplication problem
- Step #2 Factor & use the Cancellation Property
- Step #3 Multiply numerators
- Step #4 Multiply denominators
- Step #5 Product will always be in reduced form

Given $f(x) = \frac{x^2 - x - 6}{x^2 + 3x - 4}$ and $g(x) = \frac{x^2 - 5x + 6}{x^2 + 2x - 8}$, try and find $\frac{f(x)}{g(x)}$.

Step #1 Write problem as an equivalent multiplication problem.



Step #2 Factor & use the cancellation property.

$$\frac{(\quad)(\quad)}{(\quad)(\quad)} \cdot \frac{(\quad)(\quad)}{(\quad)(\quad)}$$

Step #3 What are the expressions remaining in the numerator?

Step #4 What are the expressions remaining in the denominator?

Step #5 Write your answer as $\frac{\text{product of numerator}}{\text{product of denominator}}$. List excluded values.

Practice: Determine the quotient of each expression.

$$5. \frac{9ab^2}{4c} \div \frac{5ab}{18c^2}$$

$$6. \frac{7x^2}{3x^2-27} \div \frac{4x^2}{3x-9}$$

$$7. \frac{3x^2+15x}{x^2-3x-40} \div \frac{5x^2}{x^2-64}$$

$$8. \frac{4x}{x^2y^2-xy} \div \frac{x^2-4}{3x^2+19x-14} \div \frac{x-2}{xy}$$