

Multiplying and Dividing Rational Expressions

recall these operations with fractions:

Simplify each of the following

$$\frac{1}{2} \cdot \frac{-3}{5} = \frac{(1)(-3)}{(2)(5)} = \frac{-3}{10}$$

$$\frac{50}{27} \cdot \frac{-3}{5} = \frac{50 \cancel{(-3)}}{27 \cancel{5}} = \frac{50 \cancel{(-3)}}{9 \cancel{5}} = \frac{-10}{9}$$

$$\frac{12}{27} \div \left(\frac{20}{15} \right) = \frac{12}{27} \left(\frac{15}{20} \right) = \frac{4}{9} \left(\frac{3}{4} \right) = \frac{4}{9} \cdot \frac{3}{4} = \frac{1}{3}$$

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Multiplying and Dividing Rational Expressions

Steps:

1. Factor the numerator and denominator separately.
2. Perform the mathematical operation. *(division!)*
3. Identify restrictions (where could any denominator = 0).
4. Divide out common factors to simplify.

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Ex.1 Simplify and state any restrictions

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

Steps:

1. Factor the numerator and denominator separately.
2. Perform the mathematical operation.
3. Identify restrictions (where could any denominator = 0).
4. Divide out common factors to simplify.

$$= \frac{12x}{4x^2} \quad x \neq 0$$

$$= \frac{3}{x}, \quad x \neq 0$$

$$\frac{x}{x^2} = \frac{\cancel{x}}{\cancel{x}x} = \frac{1}{x}$$

~~note?~~ vs VA!

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$$(b) \frac{-5x^3}{3y} \div \frac{y}{25x^2}$$

Steps:

1. Factor the numerator and denominator separately.
2. Perform the mathematical operation.
3. Identify restrictions (where could any denominator = 0).
4. Divide out common factors to simplify.

$$= \frac{-5x^3}{3y} \cdot \frac{25x^2}{y}$$

$$= \frac{-125x^5}{3y^2}, \quad y \neq 0, \quad x \neq 0$$

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(c) $\frac{2x+4}{x^2-9} \div \frac{x^2-4}{x^2-2x-3}$

restrict

$x \neq 3$ hole
 $x \neq -3$ VA ✓
 $x \neq -1$ hole
 $x \neq 2$ VA ✓
 $x \neq -2$ hole

$= \frac{2(x+2)}{(x-3)(x+3)} \div \frac{(x-2)(x+2)}{(x-3)(x+1)}$

$= \frac{2(\cancel{x+2})}{(\cancel{x-3})(x+3)} \cdot \frac{(\cancel{x-3})(x+1)}{(x-2)(\cancel{x+2})}$

$= \frac{2(x+1)}{(x+3)(x-2)}, x \neq \pm 3, x \neq \pm 2, x \neq -1$

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(d) $\frac{3a+6}{9a^2} \div \frac{a+2}{-3a} \cdot \frac{15a}{2}$

Note: Order of Operations, left to right

restrict

$a \neq 0$ } holes
 $a \neq -2$ }

$= \left(\frac{3(a+2)}{9a^2} \div \frac{a+2}{-3a} \right) \cdot \frac{15a}{2}$

$= \frac{\cancel{3}(a+2)}{\cancel{9}a^2} \cdot \frac{-\cancel{3}a}{(\cancel{a+2})} \cdot \frac{15a}{2}$

$= \frac{-15a^2}{2a^2}$

$= \frac{-15}{2}, a \neq 0, a \neq -2$

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Assigned Work:

p.50 # 5ad, 6adgh, 7ae, 8ab, 18

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