

Feb 10

Park

HW Check will be done on Unit test date!

MCR3U

Multiplying and Dividing Rational Expressions

Announce: Quiz on Feb 17 (Tu) and Unit Test on Feb 24 (Tu)

Recall: Evaluate

1) $\frac{2}{3} \times \frac{15}{8}$

Option 1: $\frac{2 \times 15}{3 \times 8} = \frac{30 \div 2}{24 \div 2} = \frac{15 \div 3}{12 \div 3} = \frac{5}{4}$

Option 2: $\frac{2 \times 15}{3 \times 8} = \frac{\cancel{2} \times 5 \times \cancel{3}}{\cancel{3} \times 4 \times \cancel{2}} = \frac{5}{4}$

2) $\frac{2}{3} \div \frac{6}{7}$

$= \frac{2}{3} \times \frac{7}{6} = \frac{\cancel{2} \times 7}{3 \times \cancel{2} \times 3}$

$= \frac{7}{9}$

Example 1 Simple Case

Simplify and state restrictions

* $\frac{b}{b^2} = b^1 \div b^2 = b^{1-2} = b^{-1} = \frac{1}{b^1} \frac{2a^2}{5b^2c} \times \frac{3bc^2}{8a^2} = \frac{\cancel{2} \cdot \cancel{a^2} \cdot 3 \cdot \cancel{b} \cdot c^{\cancel{2}1}}{5 \cdot \cancel{b^2} \cdot \cancel{c} \cdot \cancel{4} \cdot \cancel{a^2}}$

* $\frac{c^2}{c} = c^2 \div c = c^{2-1} = c^1 = \frac{c}{1} = \frac{3c}{20b}, c \neq 0, b \neq 0, a \neq 0$

Example 2 Multiplying Rational Expressions

Simplify and state restrictions

$\frac{x^2-9}{2x+4} \times \frac{x+2}{x+3} = \frac{(x^2-9) \cdot (x+2)}{(2x+4) \cdot (x+3)}$

$a=x, b=3$

Step 2: $\frac{\cancel{(x+3)}(x-3) \cdot \cancel{(x+2)}}{2 \cancel{(x+2)} \cdot \cancel{(x+3)}}$

Step 3: $x+2 \neq 0 \rightarrow x \neq -2$
 $x+3 \neq 0 \rightarrow x \neq -3$

Step 4: $\frac{\cancel{(x+3)}(x-3) \cdot \cancel{(x+2)}}{2 \cancel{(x+2)} \cdot \cancel{(x+3)}}$

Step 5 = $\frac{(x-3)}{2}, x \neq -2, x \neq -3$

5 steps for multiplying (or dividing) rational expressions

- Step 1: Put brackets around numerator and denominator (also flip the second fraction, if it was division)
- Step 2: Factor
- Step 3: State restrictions $x+2 \neq 0 \rightarrow x \neq -2$
 $x+3 \neq 0 \rightarrow x \neq -3$
- Step 4: A factor can be cancelled if it appears in the numerator and denominator
- Step 5: State final answer and restrictions again!

***Note: Always state restrictions before cancelling!!!**

Example 3 Dividing Rational Expressions

Simplify and state restrictions

$$\frac{x^2 - x - 20}{x^2 - 5x} \div \frac{x^2 + 9x + 20}{x^2 - 12x + 36} = \frac{(x^2 - x - 20)}{(x^2 - 5x)} \times \frac{(x^2 - 12x + 36)}{(x^2 + 9x + 20)} \quad (S1)$$

$b = -1$
 $ac = 20 \rightarrow (-5) \times 4$

$$\begin{aligned} (S2) \quad x^2 - x - 20 &= (x^2) - 5x + (4x) - 20 \\ &\quad \uparrow \quad \quad \quad \downarrow \\ &= x(x+4) - 5(x+4) \\ &= (x+4)(x-5) \end{aligned}$$

$(-5) \times 4$

$$x^2 - 12x + 36 = (x-6)^2$$

$$\begin{aligned} x^2 + 9x + 20 &\Rightarrow ac = 20, b = 9 \\ &= (x+5)(x+4) \end{aligned}$$

$$= \frac{\cancel{(x+4)} \cancel{(x-5)} \cdot (x-6)^2}{x \cancel{(x-5)} \cdot (x+5) \cancel{(x+4)}}$$

Step 4: cancelling common factors.

$$(S3) \begin{cases} x-5 \neq 0 \rightarrow x \neq 5 \\ x+5 \neq 0 \rightarrow x \neq -5 \\ x+4 \neq 0 \rightarrow x \neq -4 \\ x \neq 0 \end{cases}$$

$$(S4) \frac{(x-6)^2}{x(x+5)}, \quad x \neq 5, -5, -4, 0$$

Homework: Pg. 93 #C1, C2, (1-5)

↑
every other letter