2.6 - Multiplying and Dividing Rational Expressions

- <u>Example #1</u>
- Use multiplication to show how the expressions $\frac{mol}{L*s}$, $\frac{L}{mol}$ and s^{-1} are related.
- $\frac{\cancel{mol}}{\cancel{L}*s} \times \frac{\cancel{L}}{\cancel{mol}} = \frac{1}{s}$
- $s^{-1} = \frac{1}{s}$
- Therefore $\frac{mol}{L*s} \times \frac{L}{mol} = s^{-1}$

Example #2

- Simplify and state the restrictions. $\frac{6x^2}{5xy} \times \frac{15xy^3}{8xy^4}$.
- $= \frac{90x^3y^3}{40x^2y^5}$
- $= \frac{10x^2y^3(9x)}{10x^2y^3(4y^2)}$
- $= \frac{9x}{4y^2}; x \neq 0, y \neq 0$

Example #3

- Simplify and state the restrictions. $\frac{x^2-4}{(x+6)^2} \times \frac{x^2+9x+18}{2(2-x)}$
- $= \frac{(x+2)(x-2)}{(x+6)^2} \times \frac{(x+3)(x+6)}{2(2-x)}$
- $= \frac{(x+2)(x-2)}{(x+6)^2} \times \frac{(x+3)(x+6)}{-2(x-2)}$
- $= \frac{(x+2)(x-2)(x+3)(x+6)}{-2(x+6)^2(x-2)}$
- $= \frac{(x+2)(x+3)}{-2(x+6)}, x \neq -6, 2$

Example #4

- Simplify and state any restrictions. $\frac{21p - 3p^2}{16p + 4p^2} \div \frac{14 - 9p + p^2}{12 + 7p + p^2}$

$$= \frac{21p - 3p^2}{16p + 4p^2} \times \frac{12 + 7p + p^2}{14 - 9p + p^2}$$

$$= \frac{3p(7 - p)}{4p(4 + p)} \times \frac{(3 + p)(4 + p)}{(7 - p)(2 - p)}$$

$$= \frac{3\cancel{p}\overset{1}{\cancel{(7 - p)}}}{4\cancel{p}\underset{1}{\cancel{(4 + p)}}} \times \frac{(3 + p)\overset{1}{\cancel{(4 + p)}}}{\underset{1}{\cancel{(7 - p)}}(2 - p)}$$

$$= \frac{3(3 + p)}{4(2 - p)}; p \neq 0, -4, 7, 2, -3$$

In Summary…

- The procedures you use to multiply or divide rational numbers can be used to multiply or divide rational expressions. That is, if A, B, C, and D are polynomials, then:

$$\frac{A}{B} \times \frac{C}{D} = \frac{AC}{BD}, \text{ provided that } B, D \neq 0$$

$$\frac{A}{B} \div \frac{C}{D} = \frac{A}{B} \times \frac{D}{C} = \frac{AD}{BC}, \text{ provided that } B, D, \text{ and } C \neq 0$$