

## Math 114 – MPS: Week 1

### Group writing project – Rational expressions (6.1)

Below are the answers that your classmates came up with.

1. Explain IN WORDS what a rational expression is and what a rational function is, and what the difference is between the two. Then come up with an example of each.

- Rational expressions are fractions, so to add them we need to find the least common denominator. A rational function is a function  $f(x)$ , so every input has one output. The difference is a rational function has a domain and a rational expression does not.

- Example of a rational function:  $f(x) = \frac{x - 5}{2x^2 + 5x - 3}$

- Example of a rational expression:  $\frac{7}{5x^2 + 15x}$

2. Explain IN WORDS how to determine the domain of a rational function if you are given an equation for it and explain why this is the domain. Then come up with an example.

- To find the domain of a rational function you must use the formula  $f(x) = \frac{p(x)}{q(x)}$ . First factor the denominator  $q(x)$ , then set each factor equal to zero. The domain is the opposite of what you get.

- Example:  $f(x) = \frac{x - 3}{x^2 + 6x + 9} = \frac{x - 3}{(x + 3)(x + 3)}$   
 $x + 3 = 0$  means  $x = -3$ , so the domain is  $\{x | x \neq -3\}$

3. Explain IN WORDS how to simplify a rational expression. Then come up with an example.

- Write down the expression. Factor the top and the bottom. Cancel out what can be canceled. What is left is the answer.

- Example:

$$\begin{aligned} \frac{x^2 + 2xy - 3y^2}{2x^2 + 5xy - 3y^2} &= \frac{(x^2 + 3xy) + (-1xy - 3y^2)}{(2x^2 + 6xy) + (-1xy - 3y^2)} \\ &= \frac{x(x + 3y) - y(x + 3y)}{2x(x + 3y) - y(x + 3y)} \\ &= \frac{(x + 3y)(x - y)}{(x + 3y)(2x - y)} \\ &= \frac{x - y}{2x - y} \end{aligned}$$

4. Explain IN WORDS how to multiply rational expressions. Then come up with an example.

- Factor the expressions. Simplify (cancel). Multiply straight across.
- Example:

$$\begin{aligned}\frac{x+2}{x-7} \cdot \frac{x^2-4x-21}{x^2-4} &= \frac{x+2}{x-7} \cdot \frac{(x-7)(x+3)}{(x+2)(x-2)} \\ &= \frac{x+3}{x-2}\end{aligned}$$

5. Explain IN WORDS how to divide rational expressions. Then come up with an example.

- To divide rational expressions the two most important things are to flip and multiply. So basically apply the same steps you would to multiply but with the second expression flipped. After you flip the second expression you factor, cancel or simplify, then multiply.
- Example:

$$\begin{aligned}(9x^2-49) \div \frac{3x-7}{9} &= \frac{9x^2-49}{1} \cdot \frac{9}{3x-7} \\ &= \frac{(3x+7)(3x-7)}{1} \cdot \frac{9}{3x-7} \\ &= (3x+7)9\end{aligned}$$