Math 8
Winter 2020

Preliminary Homework
Assigned Monday, February 17

Note: Preliminary homework is always graded credit or no credit. **You get full credit for completing the assignment, whether or not your answers are correct, as long as your work shows you have thought about the problem.** The purpose of preliminary homework is to start you thinking about the topic of the next class.

You may use your preliminary homework for in-class activities with your classmates. You should be sure to think about these questions so you will be prepared.

Preliminary homework is always due at the *beginning* of the next class.

Assignment: Consider the functions

$$f(x,y) = \frac{2x^2 - 3y^2 + x^4 - y^3}{x^2 + y^2} \qquad g(x,y) = \frac{xy + x^4 + y^4}{x^2 + y^2}.$$

The domains of these functions are the entire plane $\mathbb{R}^2$ except for the origin.

If we fix $y = 0$ we get an ordinary function from $\mathbb{R}$ to $\mathbb{R}$, given by $f(x,0)$.

(1.) Find $\lim\limits_{x \to 0} f(x,0)$ and $\lim\limits_{y \to 0} f(0,y)$. What do you conclude about $\lim\limits_{(x,y) \to (0,0)} f(x,y)$?

(2.) Find $\lim\limits_{x \to 0} g(x,0)$ and $\lim\limits_{y \to 0} g(0,y)$. What do you conclude about $\lim\limits_{(x,y) \to (0,0)} g(x,y)$?

(3.) Find $\lim\limits_{a \to 0} g(a,a)$. Does this change your answer to question (2)?