

# Math 120A: Homework 1

Due: October 10, 2014

1. Send me an e-mail letting me know
  - Which courses in the 131 or 121 sequence you have had. (Only 131A is required.)
  - What you like to be called, if this is different from the registrar listing.
  - Anything else you think I should know about your background.
2. Read sections 1.1-4 in Pressley.
3. Do problems 1.1.2, 1.1.3, 1.1.7, 1.1.8, 1.1.11, 1.1.12, 1.1.15, and 1.2.3 in Pressley. (Remember that exercises that are not in the text itself are in the supplement on the course website.)
4. Consider the function  $f : \mathbb{R}^2 \rightarrow \mathbb{R}$  defined as follows.

$$f(x, y) = \begin{cases} \frac{xy^2}{x^2+y^4} & (x, y) \neq (0, 0) \\ 0 & (x, y) = (0, 0) \end{cases}$$

- Show that  $\frac{\partial f}{\partial x}$  and  $\frac{\partial f}{\partial y}$  both exist at  $(0, 0)$ .
- Show that  $f$  is not continuous at  $(0, 0)$ . (Hint: If  $f$  is continuous, then any sequence of points  $(x_i, y_i)$  in  $\mathbb{R}^2$  with  $x_i \rightarrow 0$  and  $y_i \rightarrow 0$  must have  $f(x_i, y_i) \rightarrow f(0, 0) = 0$ .)

This shows that the partial derivatives aren't the entire story when it comes to understanding multivariable functions.