

Main Exercises Week 4

MATH 130: Calculus I, Section 2

Your Name (Print): _____

Follow the general guidelines for the Main Exercises assignments (the salmon colored handout). Be sure to **staple** together your pages if you have more than one, and include your **name** at the top. Neatness is appreciated, makes a good first impression, and can earn you a bonus point!!!

Due: at the beginning of class on Monday, February 11th

Remember: Your write-up should be **your own**. You may discuss these problems with others, but **you should be alone when you write them up**, using only outlines of any group or Intern discussions. **EXPLAIN and SHOW YOUR WORK!!!** Final answers will not receive full credit without supportive explanations. You may use your own paper on which to write these up.

1. Let $f(x)$ be a piecewise function defined as $f(x) = \begin{cases} x^2 + 1 & x > 1 \\ 1 & x = 1 \\ x + b & x < 1 \end{cases}$ where the third part is defined as a line $y = x + b$ where b is an unknown constant. [Hint: It would be helpful to draw what you know about f already on a scrap piece of paper to help you think about the following questions.]

- a) Is there a value for b such that $\lim_{x \rightarrow 1} f(x)$ exists? If so, find such a b , showing your work, explain in a full sentence why it works, and then draw the graph of the function $f(x)$ (be sure to make it large enough to see) using this value for b . If not, explain in complete sentences why no such b exists.
- b) Is there a value for b such that $\lim_{x \rightarrow 1} f(x)$ does **not** exist? If so, find such a b , showing your work, explain in a full sentence why it works, and then draw the graph of the function $f(x)$ (be sure to make it large enough to see) using this value for b . If not, explain in complete sentences why no such b exists.

2. Let $g(x)$ be a function with domain $(-\infty, \infty)$ with the following properties: $\lim_{x \rightarrow 1^+} g(x)$ exists, $\lim_{x \rightarrow 1^-} g(x)$ does not exist, $\lim_{x \rightarrow -1} g(x)$ exists, and $\lim_{x \rightarrow 4} g(x)$ does not exist. Draw a graph of what g might look like. Use an axes that is large enough to see details (about 10cm or 4in in length should be good). Be sure your graph fulfills all the requirements.