

# BONUS

MATH 130: Calculus I, Sections 2 and 3

Your Name (Print): \_\_\_\_\_

**Read all directions before beginning.** Since this is bonus, it is expected that your solutions be top quality – precise, detailed, clear and neat. You may NOT discuss this with anyone besides Prof. King. You may use your notes and your book, but you may NOT use any other resources including internet resources, other texts or other people's notes. If you wish to discuss a similar problem, you may discuss Exam 3 Problem 4 with anyone, just not the problem on this handout. You must turn in your solutions on this handout. Although you may use the book to work on this, you may not copy sentences from the book. Your answers should be in your own words. You must sign the pledge at the end of the assignment in order for the assignment to be accepted.

**Due:** at the beginning of lab on Thursday, December 5th

(6 points) 1. A function  $f(x)$  satisfies all of the following conditions:

$$\lim_{x \rightarrow \infty} f(x) = -2, \quad \lim_{x \rightarrow -\infty} f(x) = 2,$$

$$\lim_{x \rightarrow 3^-} f(x) = \infty, \quad \lim_{x \rightarrow 3^+} f(x) = -\infty,$$

$$f'(x) > 0 \text{ on } [0, 3) \text{ and } (3, \infty), \quad f'(x) < 0 \text{ on } (-\infty, 0],$$

$$f''(x) > 0 \text{ on } (-2, 3), \quad f''(x) < 0 \text{ on } (-\infty, -2) \text{ and } (3, \infty).$$

Each of the conditions above tell you something about the function. The first part of this assignment is explaining what each conditions tells you. Your answers should include complete sentences for each. Some of your answers should use charts illustrating what the information is telling you. **Keep in mind that some of the conditions give you more than one piece of information! Be sure to include all the information you are given.**

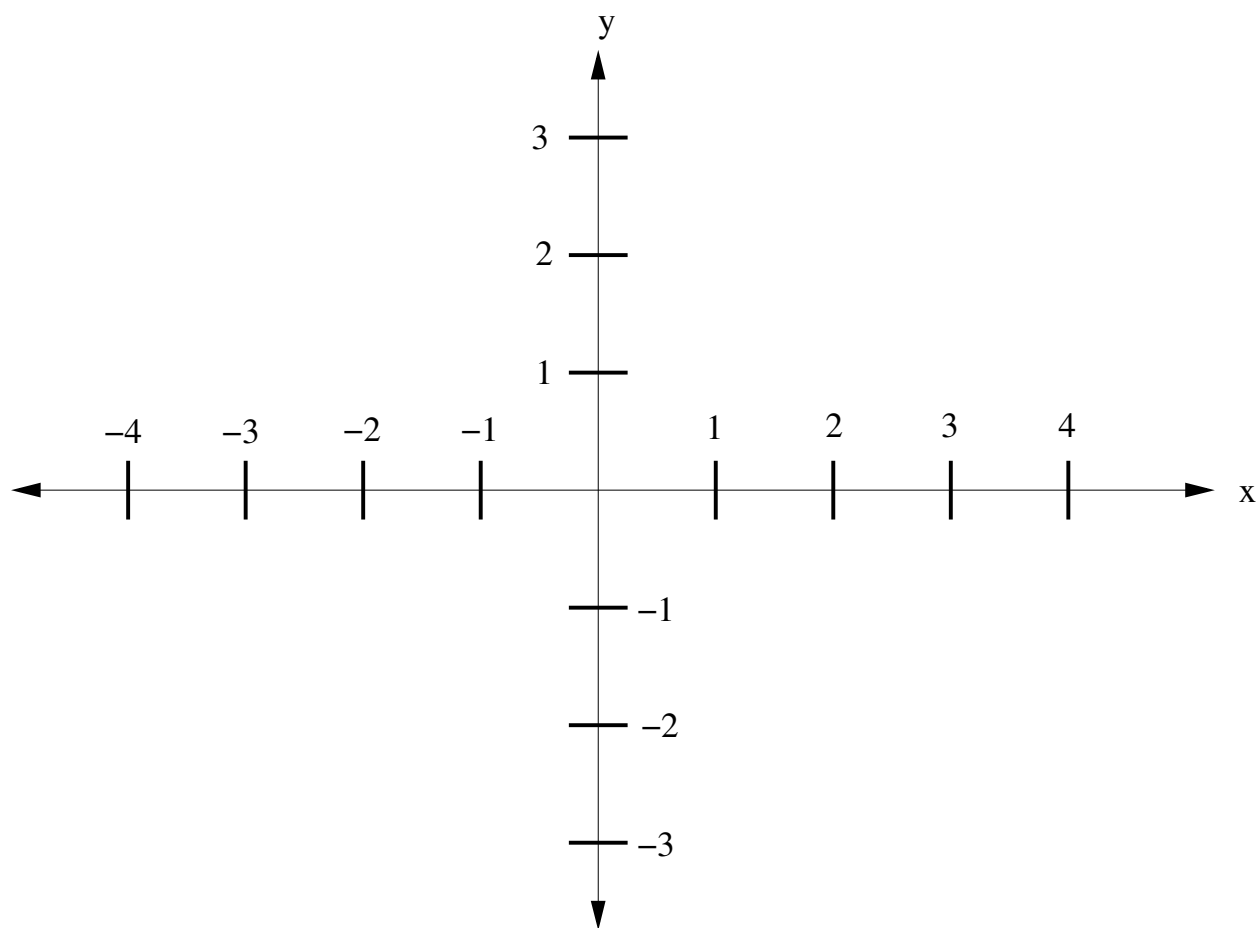
(a) What do the conditions  $\lim_{x \rightarrow \infty} f(x) = -2$ ,  $\lim_{x \rightarrow -\infty} f(x) = 2$  tell you about the function?

(b) What do the conditions  $\lim_{x \rightarrow 3^-} f(x) = \infty$ ,  $\lim_{x \rightarrow 3^+} f(x) = -\infty$  tell you about the function?

(c) What do the conditions  $f'(x) > 0$  on  $[0, 3)$  and  $(3, \infty)$ ,  $f'(x) < 0$  on  $(-\infty, 0]$  tell you about the function?

(d) What do the conditions  $f''(x) > 0$  on  $(-2, 3)$ ,  $f''(x) < 0$  on  $(-\infty, -2)$  and  $(3, \infty)$  tell you about the function?

(e) Sketch a graph. Be sure to label all asymptotes by name. Also make any local extrema and points of inflection, if they exist, clear. You have not been given  $y$  values for any of these points, but if you have local extrema or inflection points, the conditions tell you at what  $x$  values these occur. You can make a reasonable choice for the corresponding  $y$  values.



By signing below I confirm that on my honor I have not discussed this assignment with anyone besides perhaps Prof. King, nor have I used any resources other than my own book and my own notes.

---