

Math 15300/14 Homework 1

Due date: Thursday, January 16, 2020, 5pm (in my mailbox in Eckhart basement)

Please present your solutions clearly and in an organized way. Think of it this way: if you show it to another student in this class, he/she should be able to understand it without needing to ask you questions.

Wolfram Alpha

Wolfram Alpha is a very useful tool. Check it out if you have not used it before: <http://wolframalpha.com>. For example, try entering the following text into Wolfram Alpha:

- plot $y = \sin(1/x)$ (direct link)
- integrate $x/(x^2+2x+5)^2 dx$ (direct link)
- eevve curve (direct link)

January 7

Goals:

- Practice with the ϵ, K definition of $\lim_{x \rightarrow \infty} f(x) = L$.

Exercises not from the textbook:

- For the following problems, you should use the ϵ, K definition of a limit, but you do not need to write a formal proof. It is enough to include a sketch along with a short explanation, like we did in class.

(1) Show that $\lim_{x \rightarrow \infty} \frac{3}{x^2} = 0$

(2) Show that $\lim_{x \rightarrow \infty} \frac{1}{x} \neq 1$

January 9

Goals:

- Get some practice with basic properties of sequences (boundedness and monotonicity).

Section 11.2:

- 5
- 9, 15, 23, 29, 35: you should state whether each sequence is bounded above, bounded below, increasing, nondecreasing, decreasing, nonincreasing, and give an algebraic explanation for each case.
- 47, 51

January 14

Goals:

- Determine whether sequences converge, and find their limits
- Use L'Hôpital's rule to evaluate limits

Section 11.3:

- 1, 5, 9, 17, 25, 37: You do not need to use the ϵ, K definition, but you should justify your answers.

Section 11.5:

- 3, 15, 33, 49

Section 11.6:

- 5, 13, 35, 57

This is all for HW 1