MATH 20C
WINTER 2020
SECTION D00 (MANNERS)

HOMEWORK – WEEK 4

Due by 2359 (11:59 PM) on Sunday February 2. Hand in via Gradescope.

For problem 0, credit is awarded for any honest response, not for the amount of work undertaken.

For problems 1 and 2, you *must* give a fully written-out solution showing all your working and justification. Stating the correct answer, by itself, will earn no credit.

0. Do the following textbook problems. *Do not turn them in*, but provide a list here of those for which you wrote down solutions.

§2.2: 1, 2, 3, 15

(*1 points*)

1. In each case below, compute the limit, or explain why it does not exist.

(a)

$$\lim_{(x,y)\to(1,1)} \frac{(x-1)^3}{(x-1)^2+(y-1)^2}.$$

(b)

$$\lim_{(x,y)\to(1,0)} \frac{e^{xy}-1}{y}.$$

[Note $(1,0)$, not $(0,0)$. **Hint**: what is $\lim_{t\to 0} \frac{e^t-1}{t}$ in single-variable world?]

(c)

$$\lim_{(x,y)\to(1,1)} (x^2+y^2)\frac{\sin\left(\frac{(x-1)^3}{(x-1)^2+(y-1)^2}\right)}{\frac{(x-1)^3}{(x-1)^2+(y-1)^2}}.$$

(*12 points*)

2. Consider the function $f\colon \mathbb{R}^2 \to \mathbb{R}$ given by

$$f(x,y) = \begin{cases} x & : xy \geq 0 \\ 0 & : xy < 0 \end{cases}.$$

For which points $(x,y) \in \mathbb{R}^2$ is $f(x,y)$ continuous? Briefly justify your answer. [A good 3D graph sketch would suffice.]

(*6 points*)