Week 1

Tuesday, January 19, 2021 5:04 PM

- introduction
  - name: Izak (he/him/his) pronounced Isaac
    - 2nd year math graduate student
    - from Wisconsin
    - email:
    - website (I may have a section website)
  - go through names
    - name
    - year
    - where you are currently (city)
    - a good movie, show, book, or anything you recently experienced
  - office hours
    - **Tuesday and Thursday 5pm - 6pm**
    - if you have a question or don't understand something, go to office hours (mine or another GSI)! (I prefer this to emails)
      - it is **the** most efficient way to learn something
  - math 98 (MATLAB)
    - consider taking this if you are new to coding

- discussion philosophy
  - **purpose of discussion**: help you learn course material efficiently in a smaller class size
  - types of discussion
    - problem solving - I prepare a worksheet, everyone works on it.
      - ideally students work together and **discuss**. Teaching is the best way to learn
      - in practice: complete silence, I just go through the problems. This is no difference than watching a youtube video (except worse, because people on youtube are better explainers than I am).
    - office hours - I just answer questions, I don't prepare any materials
      - this is nice, especially virtually, unfortunately, most students will not have prepared questions
    - lecture - where I just lecture material
      - this is redundant, but if requested by majority of people going to discussion, I will do this
- Fluidity
  - this discussion section will change, I will ask for feedback
  - some students may come to first (or second) section and not like how it is run, and won't return. Instead give me feedback, or see if things improve.
    - discussion will be shaky for the first few weeks
  - **I am here to help you learn, not to give you a bad grade**

- Exercises (if time permits)

1) prove $\ln(1-x) \leq -x$ for $0 \leq x \leq 1$
2) suppose p^* must approximate p with relative error at most 10^{-3}. Find the largest interval in which p^* must lie for $p = 150$ and $p = 1500$

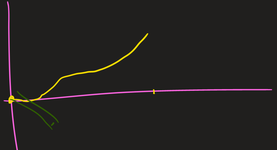
relative error : $\left|\frac{p - p^*}{p}\right|$

1) $\underbrace{-x - \ln(1-x)}_{f(x)} \geq 0$ (?) want to show $f(x) \geq 0$

@ 0 value is 0

$f(0) = 0$

And want to show $f'(x) \geq 0$ on $x \in [0,1]$



By mean value theorem: if $f(x) < 0$ for some x_0

=> there is a $\tilde{x}$ s.t. $f'(\tilde{x}) < 0$

$f'(x) = -1 + \frac{1}{1-x} = \frac{1 - 1 + x}{1-x} = \frac{x}{1-x}$

if $x \in [0,1]$ ($0 \leq x \leq 1$)

=> numerator ≥ 0

denominator ≥ 0

Fraction of non-negative things

=> $f'(x) \geq 0$

2)

$\frac{|p - p^*|}{|p|}$

$-10^{-3} \leq \frac{p - p^*}{p} \leq 10^{-3}$

$(-10^{-3})p \leq p - p^* \leq p(10^{-3})$

$(-10^{-3} - 1)p \leq -p^* \leq (10^{-3} - 1)p$

$-(-10^{-3} - 1)p \geq p^* \geq -(10^{-3} - 1)p$

$[-(10^{-3} - 1)p, -(-10^{-3} - 1)p]$

General property

$|x| < a$ if and only if $-a < x < a$