Math 160B - Winter **2022** - **Class Work - In Lecture, January 27** (No upload today.)

Name:

PID:

1. Prove that Accept_1 defined by

$$\text{Accept}_1(\ulcorner M \urcorner, w) \quad \Leftrightarrow \quad \cancel{M \text{ accepts}}\ M(w) \text{ accepts}$$

is undecidable.

2. Give a many-one reduction from Halt_0 to Halt_1.

$w \mapsto \langle w, \epsilon \rangle$.

$w \in \text{Halt}_0 \iff \langle w, \epsilon \rangle \in \text{Halt}_1$

Both mean $M(\ulcorner M \urcorner)$ halts where $w = \ulcorner M \urcorner$.

Want a function f (many-one reduction)

$f : \ulcorner M \urcorner \longmapsto \ulcorner N \urcorner$

s.t. $\ulcorner M \urcorner$ halts iff $\ulcorner N \urcorner$ accepts.

So f is a many-one reduction from Halt_1 to Accept_1

$\ulcorner N \urcorner$ is formed from $\ulcorner M \urcorner$ by replacing any instruction in M that rejects, by an instruction that accepts and halts.

Universal Algorithm:

Assumption: X decides Accept_1

Input: $\ulcorner M \urcorner$, w

Algorithm

Run $X(\ulcorner M \urcorner, w)$ and

$X(\ulcorner M' \urcorner, w)$

where M' is same as M but w/ "Accept" & "Reject" swapped

If either of these accept, then accepts