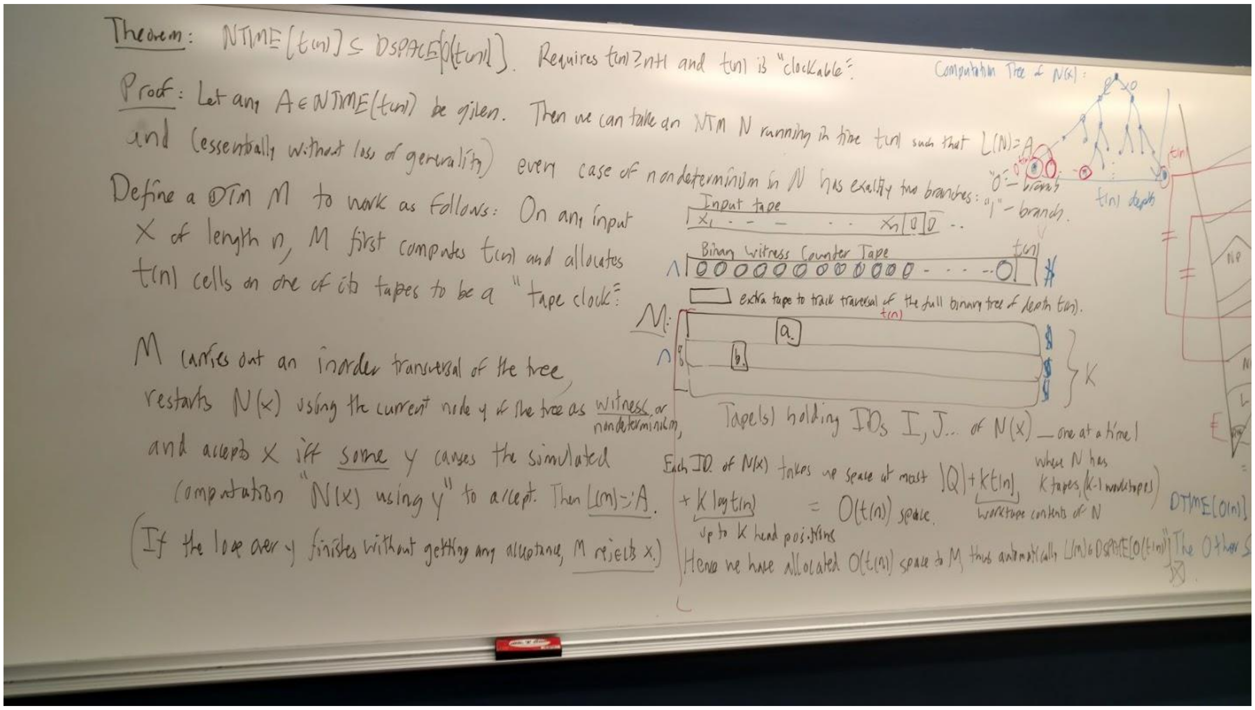
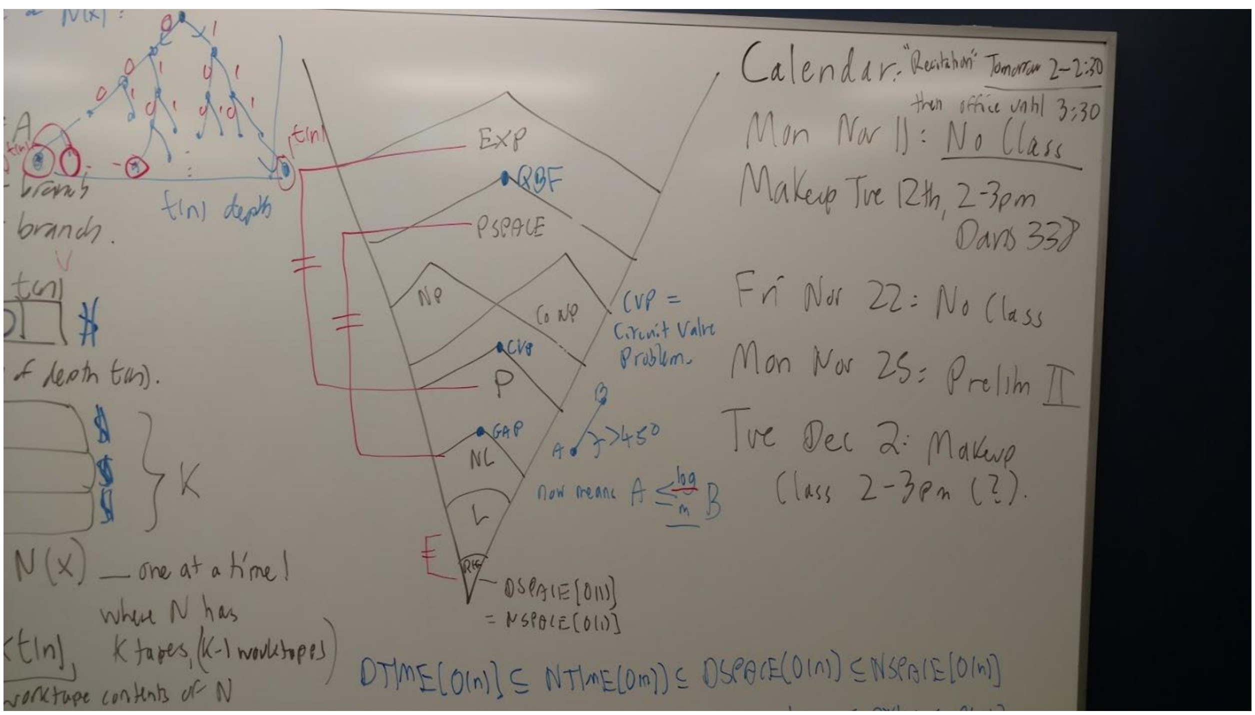
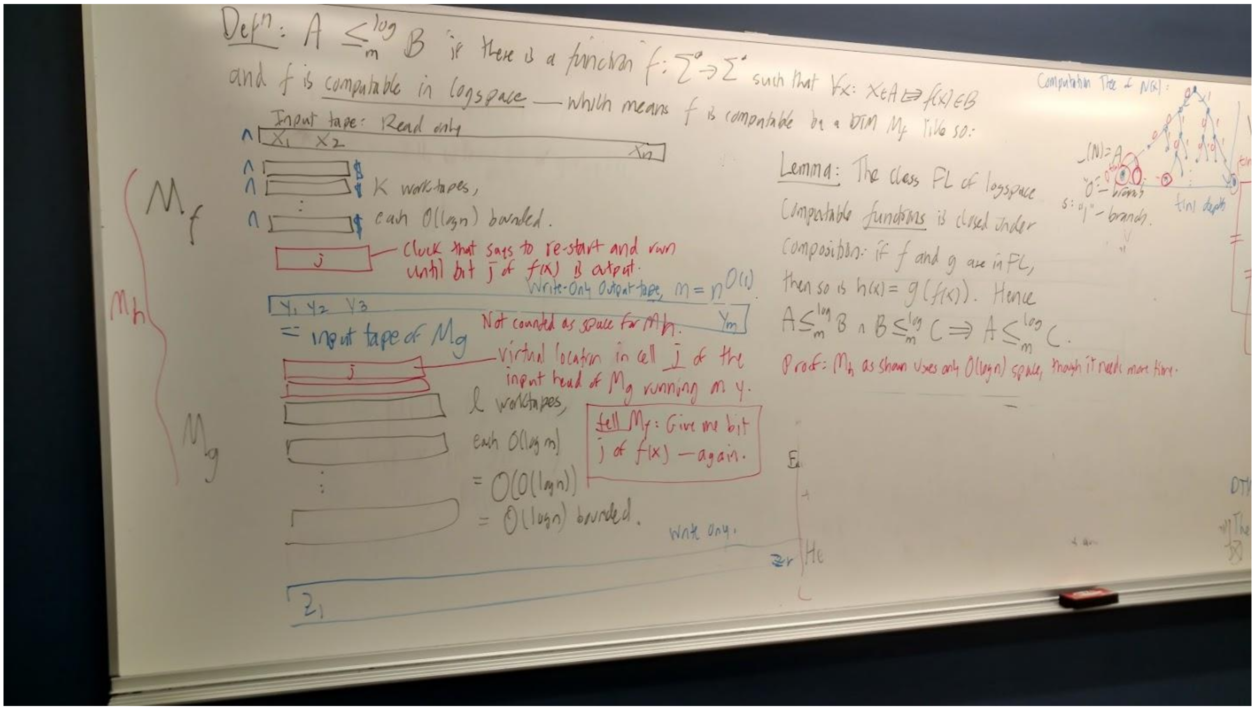
CSE596 Lecture Monday Nov. 4, 2019






Defn: $A \leq_m^{\log} B$ if there is a function $f: \Sigma^* \to \Sigma^*$ such that $\forall x: x \in A \iff f(x) \in B$
and f is computable in logspace — which means f is computable by a DTM M_f like so:
Input tape: Read only
x_1 x_2 x_n
M_f
K worktapes,
each $O(\log n)$ bounded.
Clock that says to re-start and run until bit j of f(x) is output.
j
Write-Only Output tape, $m = n^{O(1)}$.
y_1 y_2 y_3 y_m
M_h
= input tape of M_g
Not counted as space for M_h.
virtual location in cell j of the input head of M_g running on y.
j
M_g
l worktapes,
each $O(\log m)$
$= O(O(\log n))$
$= O(\log n)$ bounded.
tell M_f: Give me bit j of f(x) — again.
Write only.
z_1
z_r
Lemma: The class FL of logspace computable functions is closed under composition: if f and g are in FL, then so is $h(x) = g(f(x))$. Hence $A \leq_m^{\log} B \wedge B \leq_m^{\log} C \Rightarrow A \leq_m^{\log} C$.
Proof: M_h as shown uses only $O(\log n)$ space, though it needs more time.
Computation Tree of N(x):
"0"-branch
"1"-branch.
time depth