Math 322

$\boxed{Q's}$ 13.3 #7 V an alphabet $A \subseteq V^*$, $B \subseteq V^*$

and $A \subseteq B \rightarrow A^* \subseteq B^*$

Know?: $S^* = \bigcup_{k=0}^{\infty} S^k = S^0 \cup \boxed{S} \cup S^2 \cup S^3 \ldots$ $S^k = \underbrace{S.S. \ldots S}_{k \text{ concat.}}$

$B^0 \cup \boxed{B} \cup B^2$

$S \subseteq T$ Means: $\forall e \; e \in S \rightarrow e \in T$

Pf: show $\lceil A \subseteq B \rceil \rightarrow \lceil A^* \subseteq B^* \rceil$

show $[e \in A \rightarrow e \in B] \rightarrow [\overset{e}{w} \in A^* \rightarrow w \in B^*]$

assume $(e \in A \rightarrow e \in B)$ and $w \in A^*$ show $w \in B^*$

if $w \in A^*$ w is a concat (string) of symbols of A.

b/c $e \in A \rightarrow e \in B$ says each symbol is also of B

So $w \in B^*$ (string of symbols of B).

13.1 #13 a) $L(G) = 10, 01, 11$

$P_1 = \{ S \rightarrow 10, S \rightarrow 01, S \rightarrow 11 \}$

$P_2 = \{ S \rightarrow 10A \quad A \rightarrow \lambda \}$

$S \rightarrow 01A$

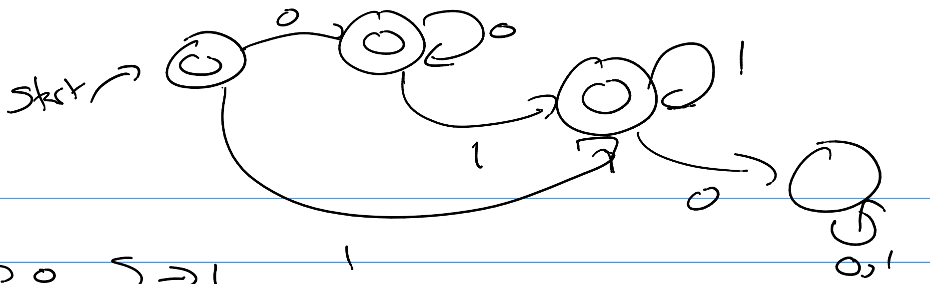
$S \rightarrow 11A$

13.4 #13 $0^* 1^*$

(creative?) → productions $S \rightarrow \lambda$, $S \rightarrow 0A$, $A \rightarrow 0A$

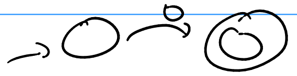
$A \rightarrow 1A$? ?$0A1$?

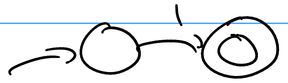
creative? F.S.A.

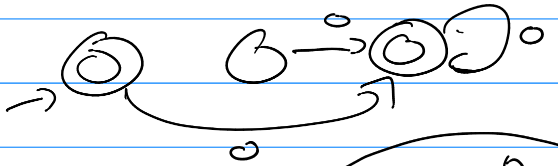


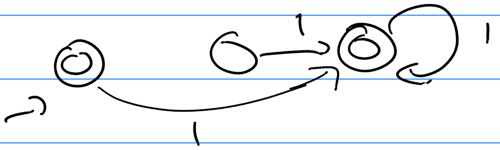
$th^m \rightarrow P = \left\{ \begin{array}{lll} S \to 0, & S \to 1 & \\ S \to \lambda, & S \to 0A, & S \to 1B \\ A \to 0A, & A \to 1B, & B \to 1B \\ A \to 0, & A \to 1, & B \to 1 \end{array} \right\}$

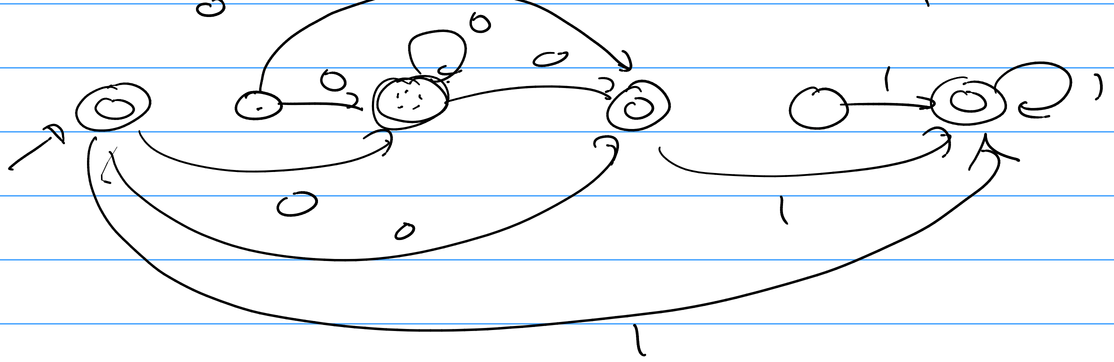
Kleene's th^m $0^* 1^*$

M_0 :


M_1 :


M_{0^*} :


M_{1^*} :


$M_{0^*1^*}$:


Exam 4 tuesday 12 probs @ 10pts
110 pts = 100%

Review for final thursday (collects exams 1 to 4)

Note: because final is comprehensive
if final % > lowest exam score
→ lowest exam gets replaced by final %

ex 70% 75% 60% 80% 71% → after 70, 75, 71, 80, 71

70%	75%	60%	80%	71%		70,	75,	71,	80,	71
E1	E2	E3	E4	Final		E1	E2	E3	E4	Final

Exam 4 Languages / Grammars / Turing

13.1 phrase-structure grammar (2 probs)

① given $G = (V, T, S, P)$

$L(G) = ?$

② given several sets of productions — Name type

$P_1 = \{S \to \lambda, \text{etc}\}$ → type a not b

$P_2 = \{\ldots\}$

$P_n = \{\ldots\}$

ex $P = \{\underset{P_1}{S \to \lambda}, \underset{P_2}{S \to aSb}, \underset{P_3}{S \to A}, \underset{P_4}{A \to abc}\}$

type 0 not 1 b/c $S \to \lambda$ and S is on right side of P_2.

13.2 F.S.M. with output (2 probs)

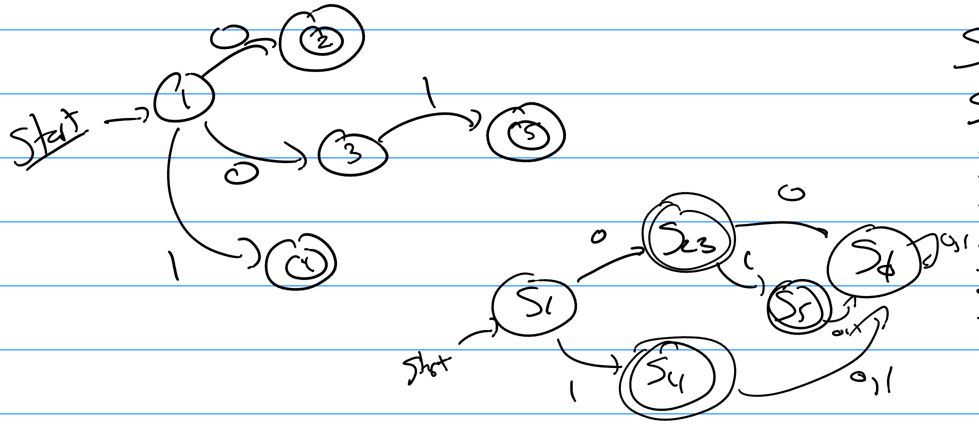
Know:
① vending
② bit delays
③ binary add
} with diagram and/or table

13.3 & 4 F.S.A. (5 probs)

① $L(M)$ M is det.

② $L(M)$ M is non-det

③ given non-det M make det M.



S_ϕ S_{12}

S_1 S_{13}

S_2 ⋮

S_3

S_4

S_5 S_{12345}

④ use Kleene's Th^n to create non-det M from a regular set.

(ex) $0^* 1^*$ above

⑤ create non-det M from regular grammar.

13.5 Turing machines (3 pbs)

① given T and input string. run T and show each step until it halts.

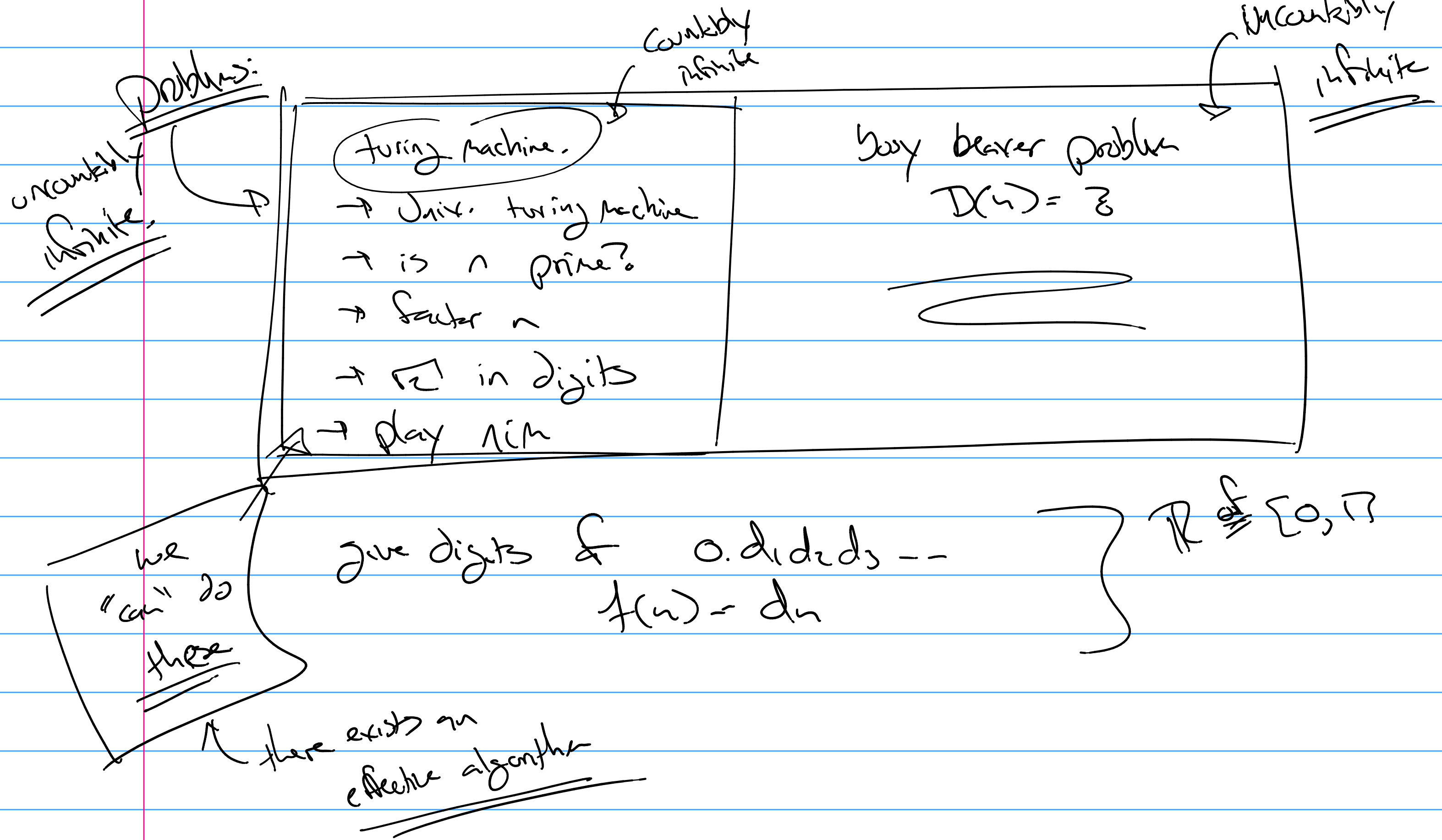
②
③ } functions: know

$n \pm$ const

$n_1 + n_2$

n mod c

What can effective algorithms do?



effective algorithms → "speed" or "time to compute"

P vs NP problems.

P class of problems says a det. Turing machine can do the problem in polynomial time based on size of input.

NP class of problems says a non-det Turing machine can do it in poly. time.