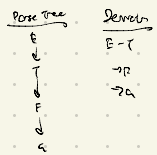
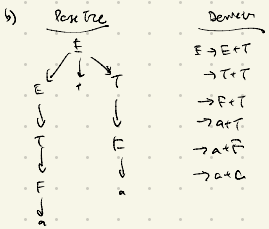
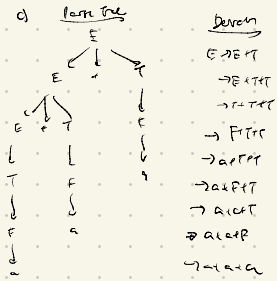
2.1a)



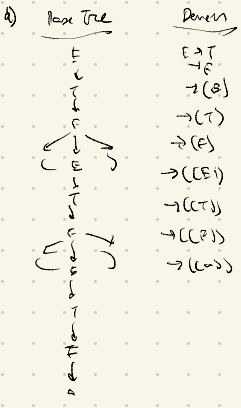
b)



c)



d)



2.6 a) $S \to X \mid \#T\#X\#T \mid X\#T \mid T\#X$

$X \to aXa \mid bXb \mid a \mid b \mid \#$

$T \to aT \mid bT \mid \#$

2.19) all strings of the form $a^n b^n$ where $n \neq 1$

$\overline{L(G)}$ = all strings of form $a^n b^n$

$S \to aSb \mid \varepsilon$

2.27) Parse G ambiguous for str.

```
if cond then
    if cond then
        a := 1
    else
        a := 0
```

Stmt → if then

→ if cond then stmt

→ if cond then if then else

→ if cond then if cond then stmt else stmt

→ if cond then if cond then assign else stmt

→ if cond then if cond then S := 1 else assign

→ if cond then if cond then a := 1 else a := 1

Stmt → if then else

→ if cond then stmt else stmt

→ if cond then if then else stmt

→ if cond then if cond then stmt else stmt

→ if cond then if cond then a := 1 else stmt

→ if cond then if cond then a := 1 else assign

→ if cond then if cond then a := 1 else a := 1

2.27 b) unambiguous.

$S \to A(S \mid \varepsilon$

$S' \to A) \mid \varepsilon$

$E \to aS'bS$

$A \to C$

2.28) ambiguous. $S \to aSbS \mid aS \mid \varepsilon$

unambiguous $S \to aSbS \mid bSaS \mid T \mid \varepsilon$

$T \to aT \mid a$

$S \to \varepsilon \mid S' \mid S''$

$S' \to P \mid PS'' \mid aP \mid P\varepsilon S''$

$S'' \to Q \mid QS'$

$P \to ab \mid aPb \mid bPa \mid aPP \mid aPbP$

$Q \to ba \mid bQa \mid baQ \mid aQb \mid bQ$

6. L = str w/ equal # a, b.

$\exists n$ where substr$(0,n)$ of w had equal #a's & b's but substr$(0,n+1)$ of w has more of one than other.

each step is grammar

$S \to aSbS$
$S \to bSaS$ } # a # b created by same amount
$S \to \varepsilon$

so rule can't have more # S & #a = #b

by induction & contradiction, grammar only generates strings of equal # a & b

7. DFA D assume every state = NT.

start state q_0 = start var.

terminal = terminal symbol

added to original states

add 2 to accepting states

every reg lang is CFG.

$S \to aT \mid bS$

$T \to aT \mid bS \mid \varepsilon$