COMS342

Homework 1

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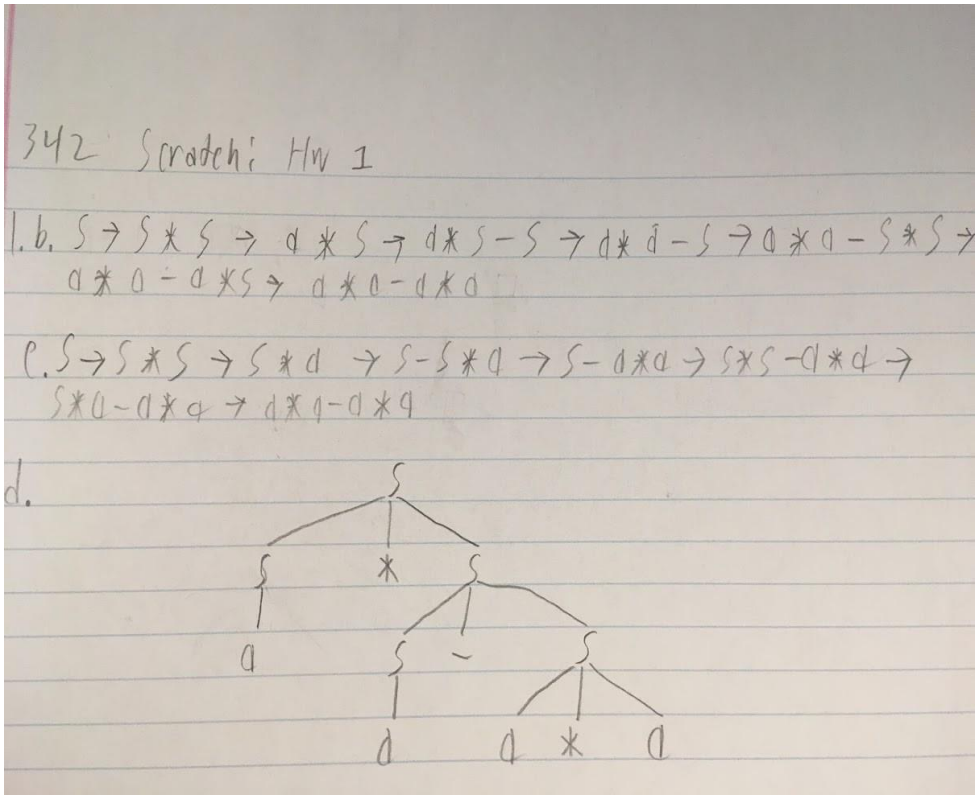
1. (a) The terminals are $-,*,a$. The non-terminal is S.

   (b) (c)

   (d) 

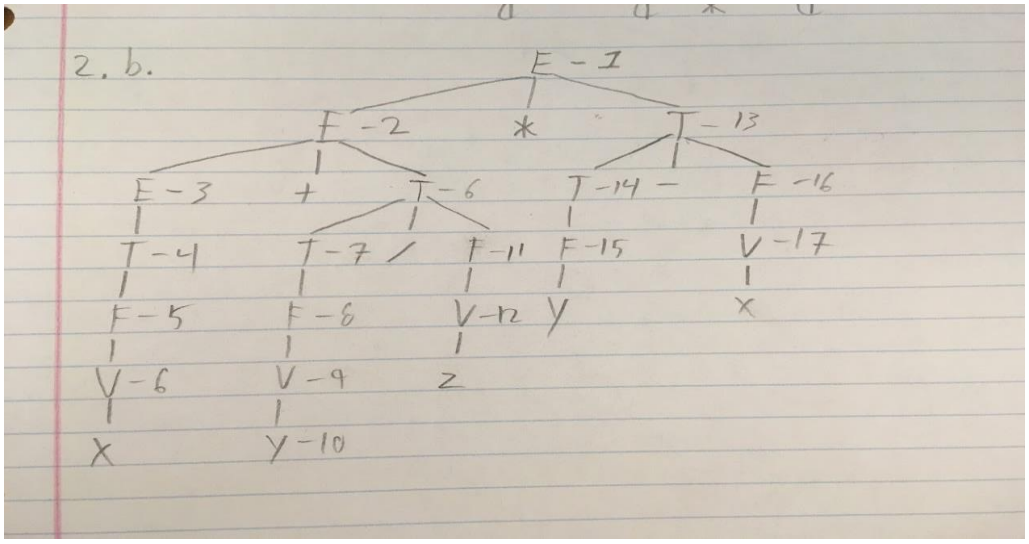
   (e) No, the left derivation will produce a different parse tree then the right derivation.

   (f) Three strings that don't belong to the language are:

   - $a * b$
   - $a * c$
   - $d - a$

2. (a) The grammar is ambiguous because there are two distinct parse that can be created using the production rule $E \rightarrow E + T|E * T|T$. If you are given a string $x + y * z$, you can create a derivation by either deriving the $x + y$ first or the $y * z$ first.

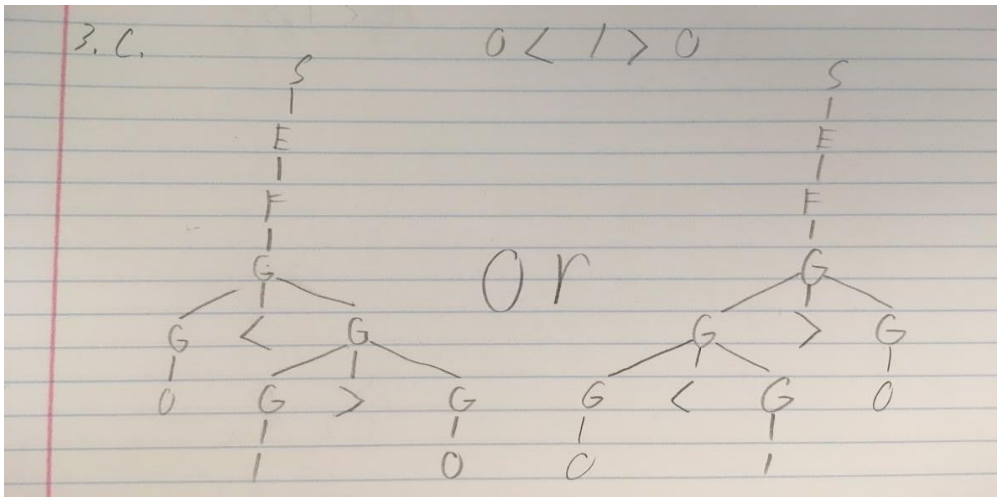
(b)



(c)

3. (a) The associativity of @, !, and < is < first, followed by !, then @ last because < is derived from G and G is derived from F, which also derives !, and F is derived from E, which also derives @. In layman's terms, you can't make an @ until you have made all the !, and you can't make a ! until you have made all the <.

(b) < will always take precedence over ! and ! will always take precedence over @ because, again, < is derived from G and G is derived from F and F is derived from E.



(c)

4. The production rules of the grammar where S is the start variable:
$V \rightarrow V@X|V.X|X$

$X \rightarrow X \times Y \mid Y$
$Y \rightarrow Z \cup Y \mid Z \cap Y \mid Z$
$Z \rightarrow \neg Z \mid a \mid b \mid c \mid true \mid false$

5. For Python:

   a) The “compound_ stmt” and the “async_stmt” can accept the “for_stmt.”

   b) Consider the following script:

```
1.  i = 5;
2.  while i != 0:
3.      print(i);
4.      i -= 1;
5.  print(”Blast off!”);
```

   Line 1 is a simple_stmt derived from a small stmt derived from a expr stmt. This is how assignment statements are handled.
   Line 2 is a compound_stmt derived from a while stmt which uses a “test” followed by a ‘:’ followed by a suite.
   Line 3 is the first suite which is a NEWLINE character, an INDENT character, and a stmt. The stmt is derived from a compound stmt derived from a funcdef that print ‘i’. Line 4 is the second suite which is a simple stmt derived from a small stmt derived from expr stmt derived from an augassign which uses ‘-=’ to decrement ‘i’ by one.
   Line 5 is the same derivation as line 3 except there is no suite with a NEWLINE character and INDENT character, the derivations starts at a compound_stmt.