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Problem Set Assignment #1
BNF

Learning Abstract:

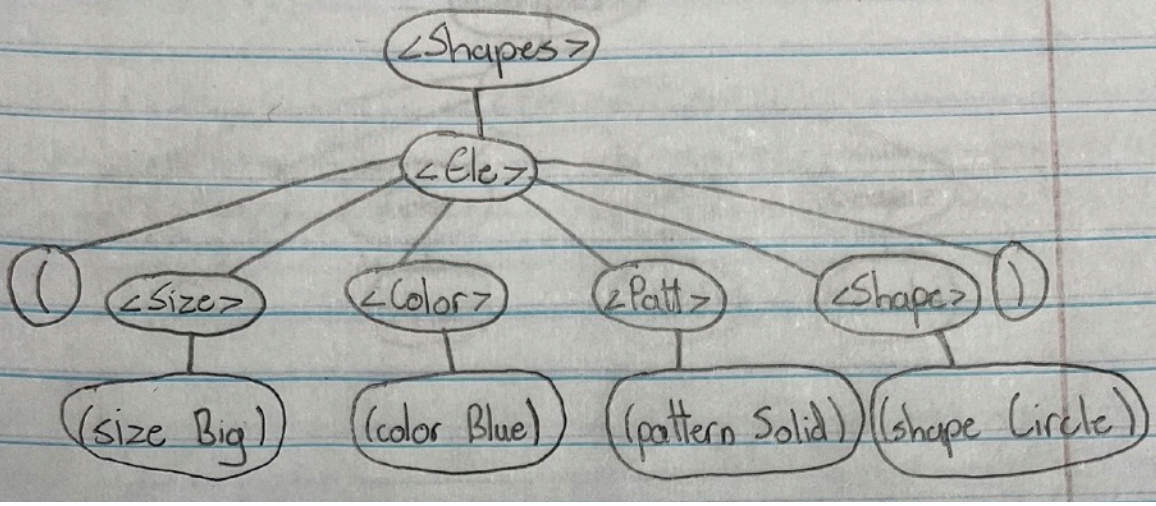
This assignment is all about BNF. You will be asked to compose some BNF grammars for given languages. You will be ask to draw some BNF parse trees. You will be asked to describe BNF in English, in a straightforward, compelling manner.

You will learn to compose BNF grammars and parse trees and learn to explain BNF in a simple yet effective way.

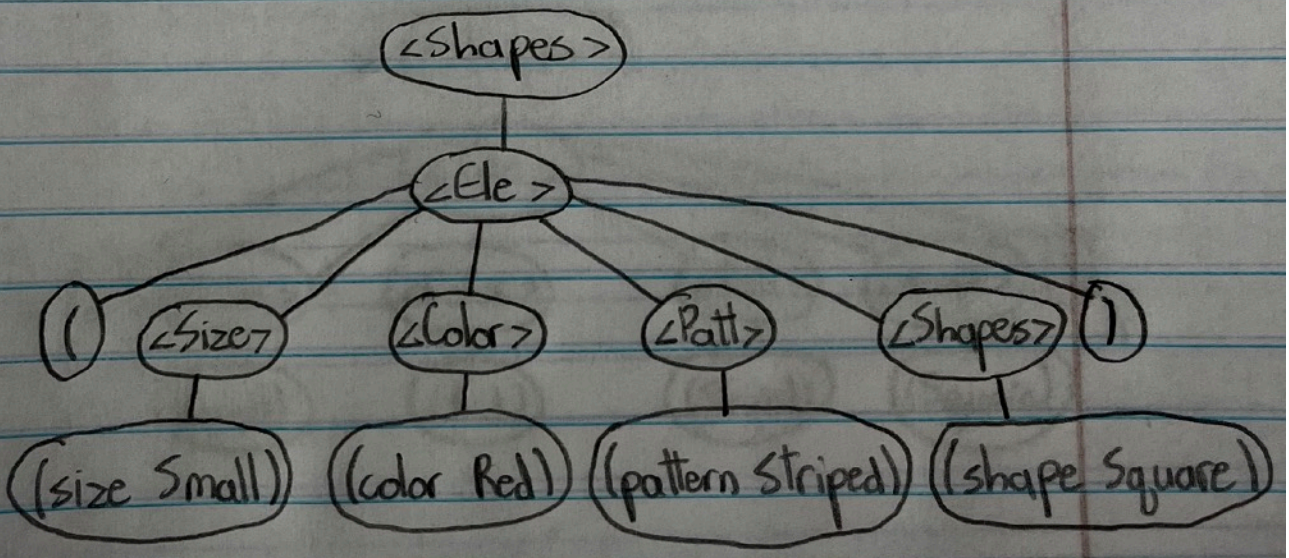
Problem #1

Shapes

<Shapes> ::= <Ele>
<Ele> ::= (<Size> <Color> <Patt> <Shape>)
<Size> ::= (size Big) | (size Medium) | (size Small)
<Color> ::= (color Red) | (color Blue) | (color Yellow)
<Patt> ::= (pattern Striped) | (pattern Dotted) | (pattern Solid)
<Shape> ::= (shape Circle) | (shape Square) | (shape Triangle)



Draw a parse tree, consistent with the BNF grammar that you crafted, for the following sentence: ((size big) (color blue) (pattern solid) (shape circle))



Draw a parse tree, consistent with the BNF grammar that you crafted, for the following sentence: ((size small) (color red) (pattern striped) (shape square))

Caption

Problem #2

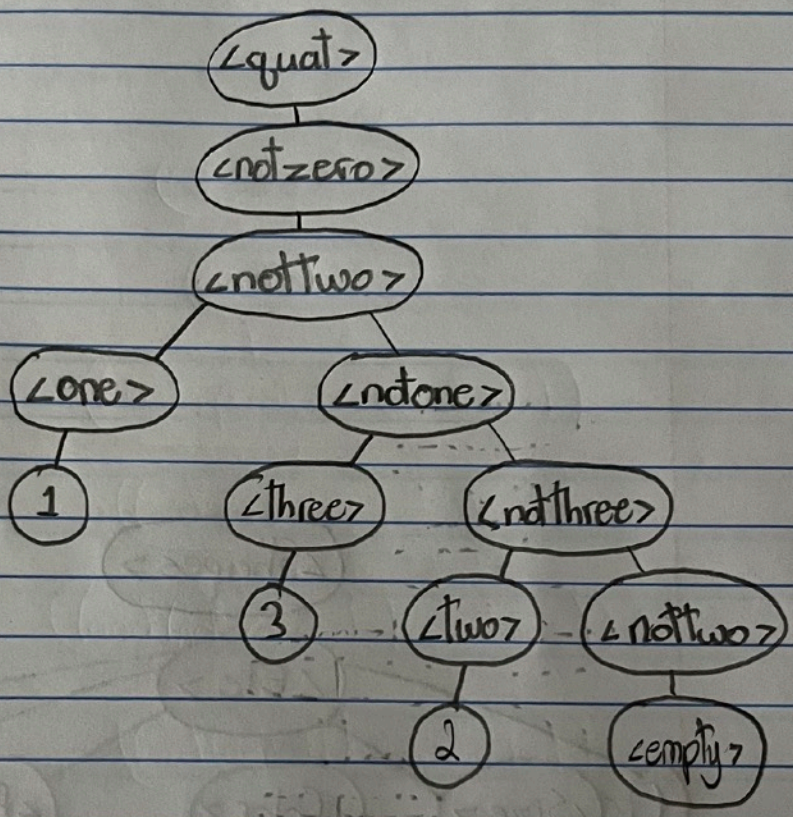
<quat> ::= <zero> |<notzero> <zero> | <notzero>
<notzero> ::= <notthree> | <nottwo> | <notone>
<notone> ::= <zero> <notzero> | <two> <nottwo> | <three> <notthree> | <empty>
<nottwo> ::= <zero> <notzero> | <one> <notone> | <three> <notthree> | <empty>
<notthree> ::= <zero> <notzero> | <one> <notone> | <two> <nottwo> | <empty>
<three> ::= 3 | 3 <notthree>
<two> ::= 2 | 2 <notwo>
<one> ::= 1 | 1 <notone>
<zero> ::= 0 | <notzero>

<quat>

<zero>

0

Draw a parse tree, consistent with the BNF grammar that you crafted, for the following sentence: 0

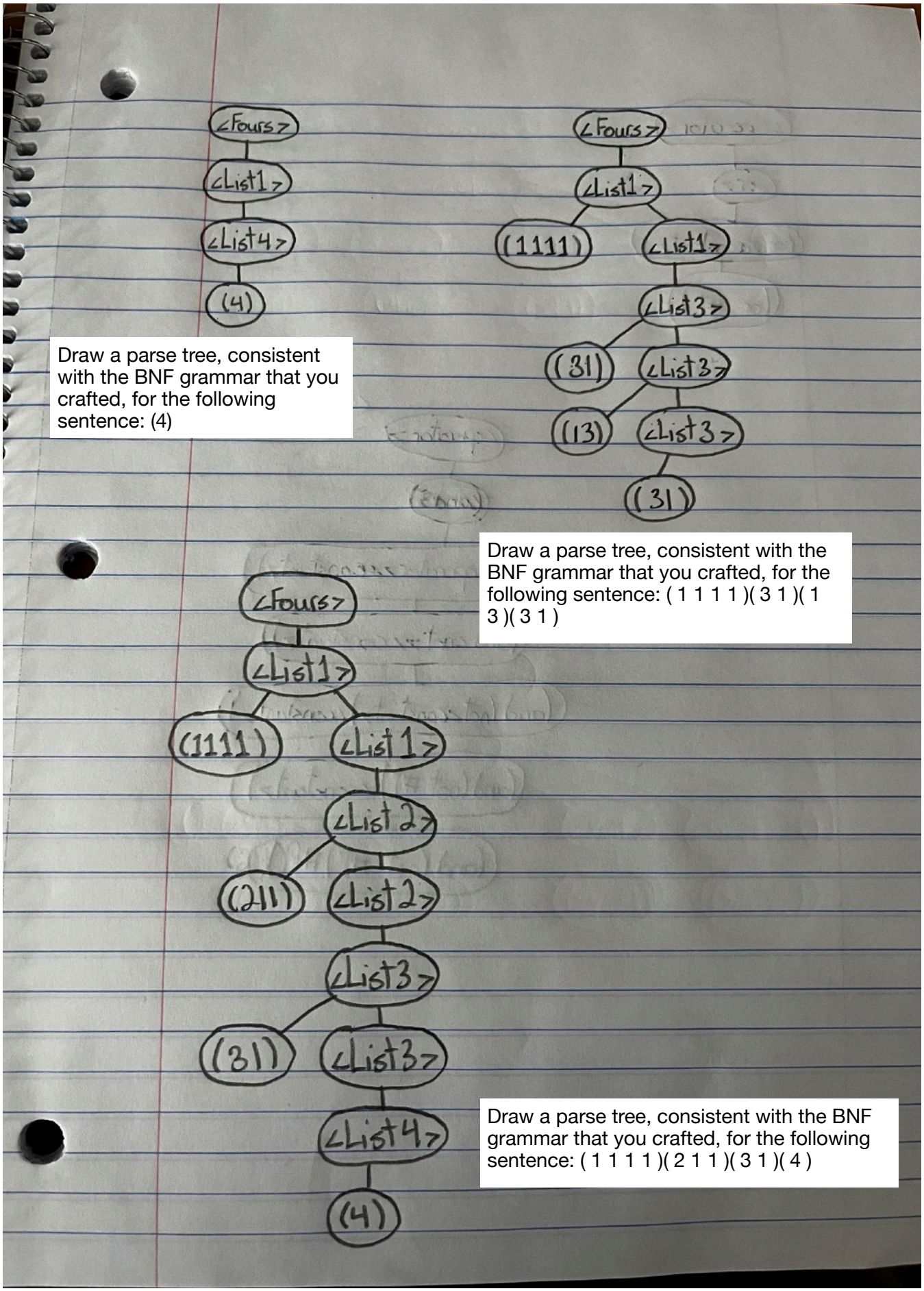


Draw a parse tree, consistent with the BNF grammar that you crafted, for the following sentence: 132

I cannot draw a parse tree for 1223 due to the fact my BNF definitions do not allow for duplicate numbers to follow one another consecutively. If you were to attempt to have two consecutively you would be able to get the first but my definition for <nottwo> will stop you from being able to add a consecutive 2.

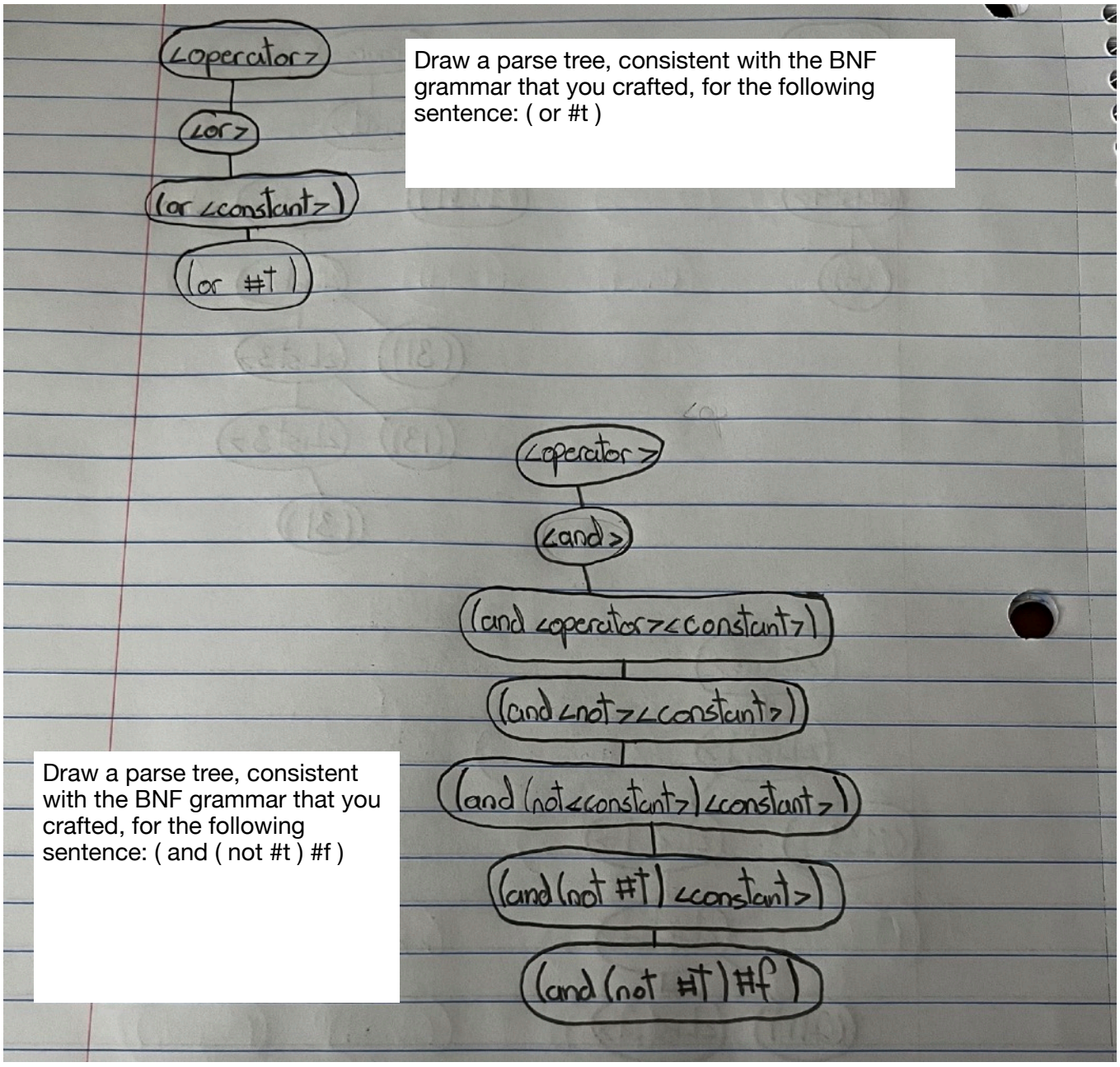
Problem #3

<Fours> **::=** <List1>
<List1> **::=** (1111) | (1111) <List1> |<List2> | <List3> | <List4>
<List2> **::=** (112) |(112) <List2> |
(121) |(121) <List2> |
(211) |(211) <List2> |<List3> |<List4>
<List3> **::=** (31) | (31) <List3> |
(13) | (13) <List3> | <List4>
<List4> **::=** (4) | (4) <List4>


<Fours>
<List1>
<List4>
(4)
Draw a parse tree, consistent with the BNF grammar that you crafted, for the following sentence: (4)
<Fours>
<List1>
(1111)
<List1>
<List3>
(31)
<List3>
(13)
<List3>
(31)
Draw a parse tree, consistent with the BNF grammar that you crafted, for the following sentence: (1 1 1 1)(3 1)(1 3)(3 1)
<Fours>
<List1>
(1111)
<List1>
<List2>
(211)
<List2>
<List3>
(31)
<List3>
<List4>
(4)
Draw a parse tree, consistent with the BNF grammar that you crafted, for the following sentence: (1 1 1 1)(2 1 1)(3 1)(4)

Problem #4

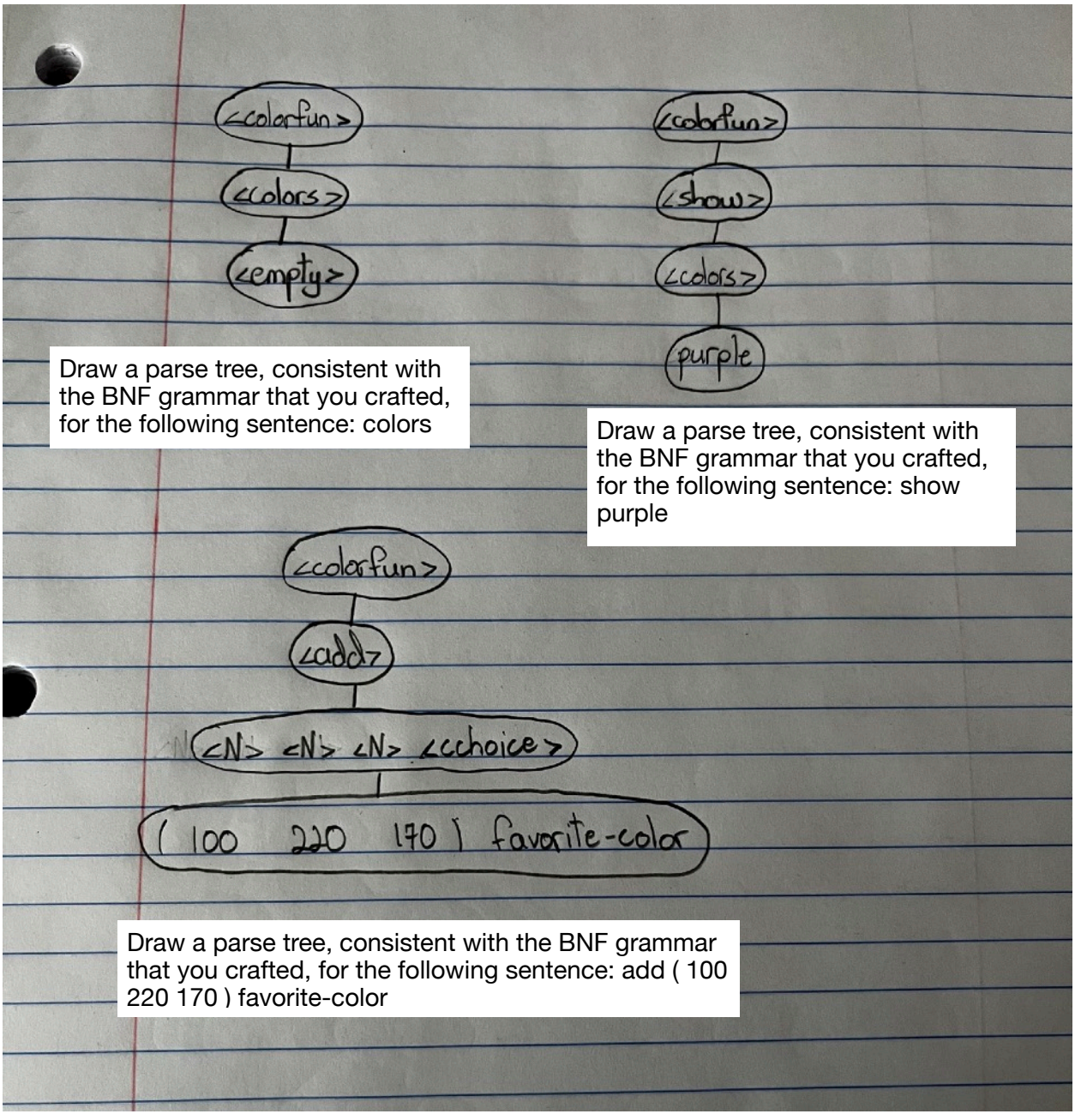
<operator> ::= <and> | <not> | <or> | <empty>
<and> ::= (and <constant>) | (and <operator) | (and <constant><operator>) | (and<operator><constant>)
<not> ::= (not<constant>) | (not<operator>) | (not<constant><operator>) | (not<operator><constant>)
<or> ::= (or<constant>) | (or<operator>) | (or<constant><operator>) (or<operator><constant>)
<constant> ::= #t | #f | #t<constant> | #f<constant>



Problem #5

(Color Fun)

<colorfun>::= <describe> | <add> | <show> | <colors>
<describe>::= <colors> | <cchoice>
<cchoice>::= <c1> |<c2> |<c3>|<c4>|<favorite-color>
<show>::= <colors> |<cchoice>
<add>::=(<N><N><N>)<color>|(<N><N><N><N>)<color>|
<color><cchoice>|(<N><N><N>)<cchoice>
<N>::= 0|1|2|3|4|5|6|7|8|9|……|255
<colors>::= light red|red|purple |<empty>



Caption

Problem #5

BNF?

BNF is the abbreviation standing for Backus-Naur form, which is a type of grammar called a context-free grammar. BNF is used to describe languages with precision. A BNF grammar consists of four major parts: tokens, nonterminals, productions, and a start symbol. Essentially, a BNF is a grammar that can be used to define a language more precisely.