CS-5340/6340, Written Assignment #1
DUE: Tuesday, September 4, 2018 by 11:59pm

1. (33 pts) For each sentence below, label each word with its correct part-of-speech (POS) tag based upon the word's use in the sentence. Do not assign POS tags to punctuation marks.

   Choose from the following list of part-of-speech tags: **adjective (ADJ), adverb (ADV), article (ART), conjunction (CONJ), gerund (GER), infinitive "to" (INF), modal verb (MOD), noun (NOUN), particle (PART), preposition (PREP), personal pronoun (PERPRO), relative pronoun (RELPRO), verb (VERB)** [not modal].

   For infinitive verb phrase constructions, label "to" as INF and the verb itself as VERB.

   NOTE: An easy way to show your part-of-speech tags is to append a slash and POS tag after each word. For example: "Natural/ADJ language/NOUN is/VERB fun/ADJ."

   (a) John might go to school to learn welding.

   (b) Fires broke out near Moab without warning

   (c) Kate, who is brilliant, builds robots.

   (d) Susan loves her house but may not stay there.

   (e) Sleeping bags can keep people from freezing on camping trips.

   (f) To quit smoking, Joe never buys cigarettes, which he craves.

   (g) Tom makes up stories about imaginary monsters.

   (h) She delicately brought up a sensitive topic to Bill.

2. (20 pts) For each sentence below, indicate whether the main verb is in an *active voice* or *passive voice* construction.

   (a) The bird quickly built an amazing nest for its young.

   (b) George has been having serious problems with his back.

   (c) Mary does not want help with her car.

   (d) The window of the Toyota Prius was broken during a hail storm.

   (e) Too much money has been spent on unnecessary trips to Europe.

   (f) He could barely understand the writing on the chalkboard.

   (g) Both girls from Utah were chosen for the summer program.

   (h) John was told about the election results by his neighbor.

   (i) Tina received several awards for her athletic skills.

   (j) The boy had seen many bears near the family's cabin.

3. (20 pts) For each sentence below, identify the noun phrases that correspond to the syntactic roles of **Subject**, **Direct Object**, and **Indirect Object** with respect to the verb phrase. Each sentence will have at least one of these syntactic roles, but not necessarily all of them!

   (a) His grandmother left her son many valuable jewels.

   (b) The cat was chased by a barking dog.

   (c) Tom Brady passed the football to his wide receiver.

   (d) Don't forget your car keys again.

   (e) George mailed his daughter a letter at her summer camp.

   (f) IBM awarded a bonus to John for his inventions.

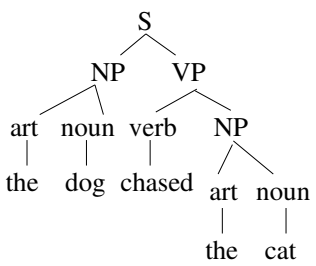
   (g) You should pick your favorite movie!

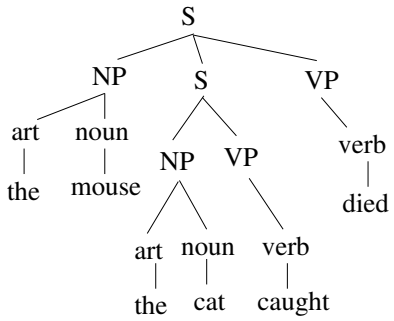
   (h) The old man promised the boy a lawn mowing job in summer.

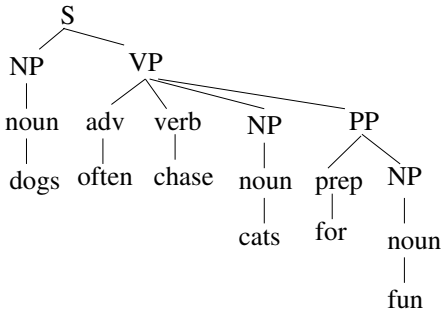
   (i) Susan was extremely happy about the news.

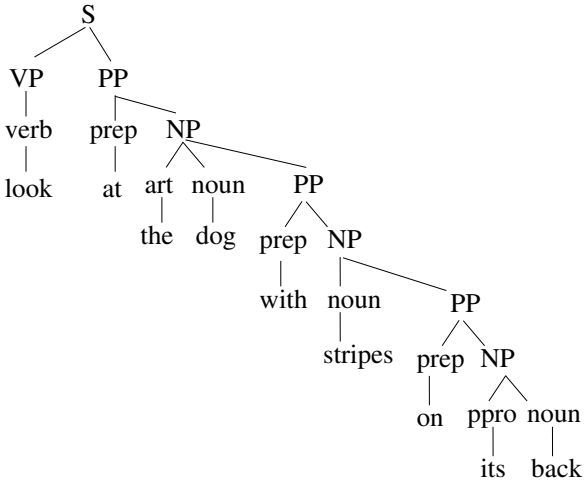
   (j) The woman with very long hair was blocking the view in the movie theater.

4. (12 pts) Consider the following parse trees:









List all of the context-free grammar rules that are depicted in the parse trees above. You only need to list grammar rules for the non-terminal symbols S, NP, VP, and PP. You do not need to list rules for the non-terminal symbols associated with part-of-speech tag assignments (i.e., noun, verb, etc.).

Some grammar rules will appear multiple times in the parse trees above, but please only list each distinct rule ONCE.

5. (15 pts) Consider the following 3 subcategorization frames:

"NP", "PP(to)", "that S"

For each verb below, indicate which of the subcategorization frames can be exhibited by the verb. A verb may have multiple subcategorization frames. If none of the subcategorization frames apply to a verb, then answer NONE. Assume common meanings for the verbs (e.g., don't search for obscure or metaphorical meanings), and the verb should be used without a particle following it.

For each subcategorization frame that you list, give an example sentence containing the verb that matches the subcategorization frame. (The verb can be used in any tense.)

(a) *drive*

(b) *laugh*

(c) *wear*

(d) *hope*

(e) *point*

Question #6 is for CS-6340 students ONLY!

6. (12 pts) Consider the following four context-free grammars to recognize Noun Phrases (NPs):

G1	**G2**	**G3**	**G4**
NP → art NP1	NP → art X	NP → NP7	NP → art W
NP → NP1	NP → adj X	NP → art NP6	NP → W
NP1 → adj NP1	NP → Y	NP → adj NP6	W → adj noun
NP1 → NP2	X → adj X	NP → art adj NP6	W → adj W
NP2 → noun	X → Y	NP6 → NP7	W → Z
NP2 → noun NP2	Y → noun	NP7 → noun NP7	Z → noun Z
	Y → noun noun	NP7 → noun	Z → noun
	Y → noun Y		

For each grammar, write a regular expression that accepts exactly the same NP language as the grammar. That is, the regular expression should recognize exactly the same set of part-of-speech tag sequences as the grammar.

You can use the Kleene star (*) operator, which means 0 or more instances, as well as the + operator, which means 1 or more instances. For example, $verb^*$ means a sequence of ≥ 0 verbs, and $verb^+$ means a sequence of ≥ 1 verbs. You can also use ϵ to represent the empty string, if you wish.

(a) G1

(b) G2

(c) G3

(d) G4

ELECTRONIC SUBMISSION INSTRUCTIONS

You should submit the answers to this assignment **in pdf format** on our course's CANVAS site by 11:59pm on Tuesday, September 4.