1. (*5 pts*) Convert the grammar below to CNF.

G = (V,T,S,P) where
V = { S, A, B, C, D}
T = { 0, 1, 2 }
 and P is given below.

S → A | ABD | 0BB
A → 0 | BAA
B → BB | 1 | 2 | λ
C → CD | 0
D → D1 | DD

2. (*10 pts*) Consider the CNF grammar G = (V,T,S,P) where

V = {S, A, B, C, D }, T = { a, b, c }, S = S and P is given below.

S → AB | AD | AC

A → AA | a

B → BB | AB | b

C → AC | DC | c

D → DD | b | c

Use the CYK algorithm to determine if the strings w_1 = babbc and w_2 = aaaabb are in the language L(G). Show the DP table. If the string is in L(G) construct the parse tree.

3. (*15 pts*) Construct npda's that accept the following languages on Σ = {**a, b** }.   Give both a verbal explanation on how your npda works and the formal definition including the transition function and/or transition graph. **You must use JFLAP**. Submit the transition graph in the HW pdf and the JFLAP code file for each problem.

a) L = { $a^n b^{2n}$: n ≥ 0 }

b) L = { w : $n_a(w) = 2n_b(w)$ }

c) L = { wcw^R : w ∈ {a,b}* }