1 CFL

Let $G = (\{S, A, B, a, b\}, \{a, b\}, S, P)$ where P consists of:

G1 $S \to AB, A \to ab, B \to bb$

G2 $S \to AB, S \to aA, A \to a, B \to ba$

G3 $S \to AB, S \to AA, A \to aB, A \to ab, B \to b$

G4 $S \to aS, S \to Sb, S \to$

G5 $S \to aS, S \to A, A \to bA, A \to$

(a) find the languages generated by G1, G2 (at home G3)

(b) Construct a derivation of a^2b^4 using G4 (at home G5).

(c) Build the parse trees of a^2b^4 using G4 (at home G5.)

2 CFG

Construct CFGs generating each of the following languages:

1. $L_1 = a^n b^m a^n$ $(0 \leq n, 1 \leq m)$
2. $L_2 = a^n b^n a^m b^m$ $(1 \leq n, m)$ (at home)

3 CFG and NL

Write a grammar that recognizes the language (viz. all the sentences) below.

1. Jonh left
2. Jonh knows Mary
3. I will leave Boston in the morning
4. Everybody likes Boston
5. A student likes Boston
6. John gave Mary a red shirt
7. John saw a man with a telescope (at home)

Construct their derivations.