

CS3133

HW#6

DUE: Thursday, September 26

1. (3 points) Remove all useless productions from the grammar

$$S \rightarrow aS \mid AB$$

$$A \rightarrow bA$$

$$B \rightarrow AA$$

What language does the grammar generate?

2. (5 points) Remove all useless productions from the grammar

$$S \rightarrow a \mid aA \mid B \mid C$$

$$A \rightarrow aB \mid \mathbf{e}$$

$$B \rightarrow Aa$$

$$C \rightarrow cCD$$

$$D \rightarrow ddd$$

3. (8 points) Remove all useless productions, \mathbf{e} -productions and unit productions to derive a grammar equivalent to

$$S \rightarrow aA \mid aBB$$

$$A \rightarrow aaA \mid \mathbf{e}$$

$$B \rightarrow bB \mid bbC$$

$$C \rightarrow B$$

$$D \rightarrow BA$$

4. (5 points) Remove all unit productions to derive a grammar equivalent to

$$S \rightarrow aA \mid B$$

$$B \rightarrow A \mid ab$$

$$A \rightarrow a \mid bc \mid B$$