

CS 4810 Homework Assignment 8 due Monday class Oct 23.

1. Why does a machine construction for combining two pushdown automata for union work but combining two pushdown automata for intersection not work?
2. Let  $h$  be the homomorphism defined by  $h(a) = b$  and  $h(b) = a$ . Let  $L = \{w(h(w))^R \mid w \in \{a, b\}^*\}$ . Prove that  $L$  is a context-free language.
3. Use dynamic programming to determine if the string  $bababa$  is in the language generated by the grammar

$$S \rightarrow AB|BC$$

$$A \rightarrow BA|a$$

$$B \rightarrow CC|b$$

$$C \rightarrow AB|a$$

4. Prove that every context-free language over a one symbol alphabet is a regular set.
5. The operation  $\text{half}$  applied to a language is the set of first halves of all even length strings.  $\text{half}\{0110, 000\} = \{01\}$  Is the class of context-free languages closed under the operation  $\text{half}$ ?