ASU ID:

Name:

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G. Farin

Midterm # 2

In the following, assume an alphabet $\Sigma = \{0, 1\}$ unless stated otherwise. Several questions will use the languages
$L_1 = \{w | w = 0x0\}$,
$L_2 = \{w | w = (01)^i (100)^i; i > 0\}$,
$L_3 = \{w | w = 0^i 1^j 0^i; i, j > 0\}$,

1. Which of these languages is/are regular, context-free, or neither? Explain your answers.

2. Find a PDA for L_2.

3. Is $L_1 \cup L_3$ a regular language? a context-free language? Explain your answers.

4. Construct a PDA for $L_1 L_2$.

5. Suppose you are given a DFA with $\Sigma = \{0\}$, states $\{q_0, q_1, q_2, q_3\}$ with accepting state $\{q_2\}$ and start state q_0 with transition function $\delta(q_i, 0) = q_{i+1}$ for $i = 0, 1, 2$ and $\delta(q_3, 0) = q_3$. Can this DFA be minimized? Explain your answer.

6. Let a CFG be given by

$$S \to AS|\epsilon \quad A \to AA|B0 \quad B \to BS|1$$

Is the string 001 in the language generated by this grammar? Explain your answer.

7. Find a CFG for L_2^R.