CS 360 Assignment 2

Due Date Tuesday, February 23nd, at the beginning of class.

All questions are worth the same amount. Please ensure that your name and student number appear, in ink, on each page of your assignment.

Work is to be done individually.

Assignment Questions

1. Let L be a regular language over the alphabet Σ. Describe a procedure to determine whether $L = \Sigma^*$.

2. Let $L = \{x \in \{0,1\}^* |\ x \text{ has an equal number of 0s and 1s}\}$. Show that L is not a regular language.

3. Let $G = (V, \Sigma, R, S)$ be a CFG. For all $x, y, z \in (V \cup \Sigma)^*$ prove that if $x \stackrel{*}{\Rightarrow} y$ and $y \stackrel{*}{\Rightarrow} z$ then $x \stackrel{*}{\Rightarrow} z$.

4. Consider the context free grammar G given below:
   $S \rightarrow aS|Sb|a|b$.

   Give an informal description of the language $L(G)$ and then prove that no string in $L(G)$ has ba as a substring.

5. Prove that the language $L = \{0^k 1^m 0^n | k = m \text{ or } m = n \text{ or } k = n\}$ is context free.