

Homework Assignment #3
Due: February 9, 2011 at 2:30 p.m.

1. Consider the alphabet $\Sigma = \left\{ \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} 0 \\ 1 \end{pmatrix}, \begin{pmatrix} 1 \\ 0 \end{pmatrix}, \begin{pmatrix} 1 \\ 1 \end{pmatrix} \right\}$. Let L be the set of all strings over the alphabet Σ where the top row is the reverse of the bottom row. More formally, a string $\begin{pmatrix} a_1 \\ b_1 \end{pmatrix} \begin{pmatrix} a_2 \\ b_2 \end{pmatrix} \cdots \begin{pmatrix} a_\ell \\ b_\ell \end{pmatrix}$ is in L if and only if $a_i = b_{\ell+1-i}$ for all $i \in \{1, 2, \dots, \ell\}$.

For example, the string $\begin{pmatrix} 0 \\ 1 \end{pmatrix} \begin{pmatrix} 1 \\ 1 \end{pmatrix} \begin{pmatrix} 1 \\ 0 \end{pmatrix} \begin{pmatrix} 0 \\ 1 \end{pmatrix} \begin{pmatrix} 1 \\ 1 \end{pmatrix} \begin{pmatrix} 1 \\ 0 \end{pmatrix}$ is in L since the top row, 011011, is the reverse of the bottom row, 110110.

Is L regular? Prove your answer is correct.