

Math 387

Homework 3

Due Friday, September 25

Practice exercises from the book

2.1, 2.4, 2.5, 2.6, 2.9, 2.10, 2.15

Problems

1. For each of the following languages, give a CFG that generates the language. In all cases $\Sigma = \{0, 1\}$.
 - (a) $L = \{w \mid w \text{ contains at least three 1s}\}$.
 - (b) $L = \{w \mid w \text{ has odd length and its middle symbol is 0}\}$.
 - (c) $L = \{0^m 1^n \mid m \neq n\}$.
 - (d) $L = \{w \mid w \text{ has exactly twice as many 0s as 1s}\}$.
2. Draw the state diagram of a PDA that accepts each of the following languages. In all cases $\Sigma = \{0, 1\}$.
 - (a) $L = \{0^m 1^n \mid m \neq n\}$.
 - (b) $L = \{w \mid w \text{ contains more 0s than 1s}\}$.

Bonus problems

1. Let G be the following CFG:

$$\begin{aligned} S &\rightarrow aSb \mid bY \mid Ya \\ Y &\rightarrow bY \mid aY \mid \epsilon \end{aligned}$$

Give a simple English description of the language of G . Use this description to give a CFG that recognizes the complement of that language.

2. $L = \{xy \mid |x| = |y| \text{ and } x \neq y\}$.
 - (a) Give a CFG that generates the language L .
 - (b) Give a PDA that accepts the language L .