# CSCI 340 — Homework 10

Dr. Schwartz

1. Decide whether or not the following grammars generate any words. Show work!

   i

   $$S \to aSa \mid bSb$$

   ii

   $$\begin{aligned} S &\to AB \\ A &\to BC \mid b \\ B &\to CD \\ C &\to DA \\ D &\to a \end{aligned}$$

   iii

   $$\begin{aligned} S &\to XS \\ X &\to YX \mid a \\ Y &\to YY \mid XX \end{aligned}$$

2. Decide whether or not the following grammars generate finite or infinite languages. Show work!

   i

   $$\begin{aligned} S &\to XS \mid b \\ X &\to YZ \\ Y &\to ab \\ Z &\to XY \end{aligned}$$

   ii

   $$\begin{aligned} S &\to XY \mid bb \\ X &\to YX \\ Y &\to XY \mid SS \end{aligned}$$

iii

$$
\begin{aligned}
S &\rightarrow XY \\
X &\rightarrow AA \mid XY \mid b \\
A &\rightarrow BC \\
B &\rightarrow AC \\
C &\rightarrow BA \\
Y &\rightarrow a
\end{aligned}
$$

3. Build a TM that accepts the language of all words that do not contain the substring *bbb*
4. Build a TM that accepts $\{ a^n b^{2n} \}$
5. Trace *aabbaa* on the Turing Machine on Slide 11
6. Trace *aabbaa* on the Turing Machine on Slide 7