

```
\documentclass{article}
\usepackage[linguistics]{forest}
\usepackage{tikz,amsmath, amssymb, }
\usetikzlibrary{automata,positioning}
\begin{document}
Caitlin Wiley
```

CMSC 208
 $\begin{flushright}$

Homework 2
 \bigskip

$\end{flushright}$

Question 1:

Assume its regular.

Make an example string: $s = [a^n b a^n b a^n b]$

Let's say $n = 3$

so the sample string becomes $s = aaabaaabaaab$

Now break it down into 3 parts (x,y,z) ;

$x = aaaba$

$y = aab$

$z = aaab$

$[xy^2z]$

aaabaaabaabaaab Doesn't Work

$[xy^3z]$

aaabaaabaabaaab Also Doesn't Work

\bigskip

Therefore the this is not a regular language because the pumping lemma cannot be applied.

\bigskip

Question 2:

```
\begin{tikzpicture}[shorten >=1pt,node distance=2cm,on grid,auto]
  \node[state,initial,accepting] (q_0) {$q_0$};
  \node[state,accepting] (q_1) [right=of q_0] {$q_1$};
  \node[state] (q_2) [right=of q_1] {$q_2$};
  \node[state](q_3) [right=of q_2] {$q_3$};
  \node[state,accepting](q_4) [right=of q_3] {$q_4$};
  \path[->]
    (q_0) edge node {1} (q_1)
    (q_1) edge node {1} (q_2)
    (q_2) edge node {1} (q_3)
    (q_3) edge node {1} (q_4)
    (q_4) edge [loop above] node {1} ();
\end{tikzpicture}
\bigskip
```

Question 3:

(a)

Terminals = (1,@)

Variables: A,B

w (@,1)

A \rightarrow 1A

A \rightarrow 1B

B \rightarrow @

11A

111B

111@ Done

\bigskip

(b)

Terminals = (@,1)

Variable: A,B

w (@,1)

A \rightarrow 1A

A \rightarrow 111B

B \rightarrow 1

11A

11111B

111111 Done

\bigskip

Question 4:

a:

Add the first two sightings of 1 to the stack individually. When the third 1 is seen pop both of the 1's located on the stack and it is empty. You can just loop in the accept state for the remaining of the string once it gets past having 3.

b:

Push all 1's onto the stack. Pop them off in pairs of 2. If the stack symbol is there accept if it is not there reject.

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Question 5:

a:

```
\begin{forest}
  [e[e[t{f{a}}]][+][t{f{a}}]][+][t{f{a}}]]
\end{forest}
```

b:

```
\begin{forest}
  [e[t[f[(e)[(t)[(f)[((e))[(t)[(f)[((a))]]]]]]]]]]
\end{forest}
```

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\end{document}
```