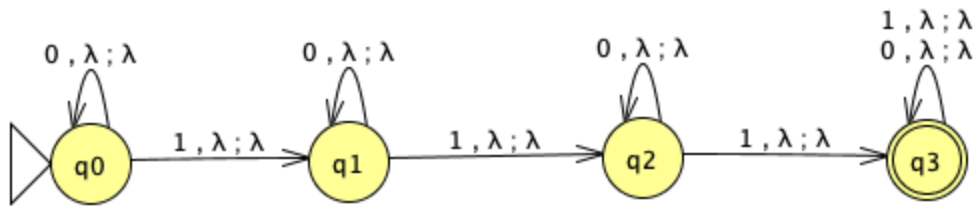


## CSE 355: Intro to Theoretical Computer Science

### Recitation #8 (20 pts)

Use [JFLAP](http://www.jflap.org) (<http://www.jflap.org>) to draw the state diagram of the PDA (pushdown automata) that recognize the following languages, assume alphabet  $\Sigma = \{0, 1\}$ .

1. [5 pts]  $L = \{\omega \mid \omega \text{ contains at least three 1s}\}$



2. [5 pts]  $L = \{\omega \mid \text{the length of } \omega \text{ is odd and its middle symbol is a 0}\}$

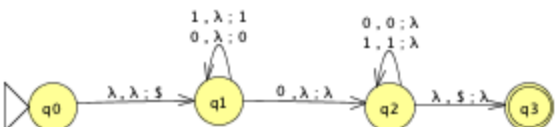
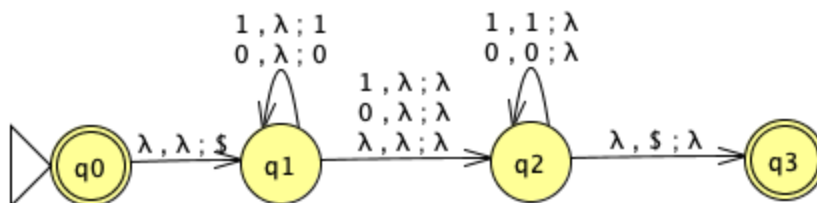


Table Text Size

Input	Result
101	Accept
000	Accept
11011	Accept
10001	Accept
111	Reject
010	Reject
11111	Reject
00100	Reject
00000	Accept
10001	Accept
01010	Accept
0000	Reject
1111	Reject
11	Reject
00	Reject
1001	Reject
1010	Reject
0101	Reject
111100	Reject
100001	Reject

Load Inputs
Run Inputs
Clear
Enter Lambda
View Trace

3. [5 pts]  $L = \{w \mid w = w^R, \text{ that is } w \text{ is a palindrome}\}$



4. [5 pts]  $L = \{w \mid w \text{ has twice as many } 1\text{'s as } 0\text{'s}\}$  (Note: this is a little complicated. Use sample string such as 001111, 111100, 010111 or 101101, etc to check your PDA's state diagram)

Table Text Size

Input	Result
0	Reject
00	Reject
1	Reject
11	Reject
001	Reject
011	Accept
101	Accept
110	Accept
1111	Reject
0000	Reject
1100	Reject
0011	Reject
11100	Reject
01010	Reject
10101	Reject
110011	Accept
011110	Accept
101110	Accept

Load Inputs
Run Inputs
Clear
Enter Lambda
View Trace