

## MIDTERM, MORNING CLASS

1.

1.1

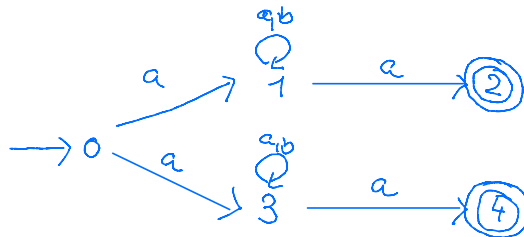
Write down a regular expression for the language over the alphabet {a,b} of all words where the last two letters are different.

1.2

Write down an epsilon-NFA for the language of 1.1.

2.

Consider the NFA given by the following state transition diagram.



Transform this NFA into a DFA. Write out the table of the DFA and its state-transition diagram.

3.

Consider the following C++ program and the grammar Cpp.cf we used as the starting point for Assignment 1.

```
void main () { bool x = 0 ; return x = x+++2 ; }
```

(Note that this question is only about parsing, do not worry about the fact that the program fails to type check.)

3.1

Show the steps taken by a shift-reduce parser. Label the reduction steps by the corresponding name of the rule of the grammar.

3.2

Write out the abstract syntax tree of the program (in 2-dimensional, not in linearized, notation).