CS344: Programming Languages
Homework 2

Required Problems

1. Write regular expressions to capture the following regular languages:

   (a) The set of 0-1 strings which start with a 0 and have odd length, or start with a 1 and have even length.

   (b) The set of 0-1 strings which contain an even number of 0's or exactly two 1's.

   (c) Numeric constants in C. These are octal, decimal, or hexidecimal integers, or decimal or hexidecimal floating point values. A decimal integer must begin with a digit between 1-9. An octal integer begins with 0, and may contain only the digits 0-7. A hexidecimal integer begins with 0x or 0X, and may contain the digits 0-9 and a/A - f/F. A decimal floating point value has a fractional portion (beginning with a dot) or an exponent (beginning with E or e). Unlike a decimal integer, it is allowed to start with 0. A hexidecimal floating point value has an optional fractional portion and a mandatory exponent (beginning with P or p). In either decimal or hexidecimal floating point numbers, there may be digits to the left of the dot, the right of the dot, or both, and the exponent itself is given in decimal, with an optional leading + or - sign. An integer may end with an optional U or u (indicating unsigned), and/or L or l (indicating long) or LL or ll (indicating long long). A floating point value may end with an optional F or f (indicating float - single precision) or L or l (indicating long - double precision).
   Examples include:

Example	Type
49274	A decimal integer
036325	An octal integer
9A348	Invalid - not decimal or hexidecimal
09362	Invalid - not valid decimal or octal
0x93AF2	Valid hexidecimal integer
083.269	Valid decimal floating point
1.083551E-14	Valid decimal floating point number
0x3.3333333333334p-5	Valid hexidecimal floating point number

2. Write DFAs or NFAs for the languages in problem 1.

3. (a) Describe in English the language defined by the regular expression $a^*(ba^*ba^*)^*$.

   (b) Give a context free grammar that generates the same language. Is your grammar ambiguous? Justify your answer.

   (c) Show a (rightmost) derivation of the string *baabaaabb*.