CS 381 Fall 2000
Solutions to Homework 4

Handout #9

Problem 1

(a)-(i)
(b)-(iii)
(c)-(v)
(d)-(iv)
(e)-(ii)

Problem 2

$(ab^*a + ba^*b)^*(ab^* + ba^*)$

Handout #10

Problem 1

(a) $h^{-1}(A) = \{\epsilon\}$
(b) $h(B) = (01 + 0)^*$
(c) $h^{-1}(C) = a^*$

Handout #11

Problem 1

The proof will be by contradiction. Assume that the languages are regular and are accepted by a DFA with n states. Let x be the sufficiently long string which will be used to give the contradiction.

(a) Let $x = a^n ba^n$. Clearly $x = rev(x)$. Hence we can apply pumping lemma to this string. Note that v will *always consists of a's to the left of b .}. Hence pumping this region will result in a new string which has an asymmetrical distribution of a's around b. Hence the new string is not in the language. Hence the original language is not regular.*

(b) Let $x = (^n)^n$ *{ n "(" followed by n ")"} . In this case v will* always consists of "(". Hence the pumped up string has no longer equal number of right & left parenthesis, a necessary condition for balanced string of parentheses.

Problem 2

(1) No. Use homomorphism $h(a) = 0$ and $h(b) = 11$.

(2) No. Let $L = \{a^n b^m | n \neq m\}$. Let L^C denote the complement of L. Then if L is regular, it implies $a^n b^n = a^* b^* \cap L^C$ is regular, a contradiction.

(3) No. Take $z = a^n ca^n$ where n is the number of states in the DFA and show a contradiction using the pumping lemma.

(4) Yes.