Homework 4

Joe Puccio

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2.3.7

(b) This automata accepts all strings of even length over {a,b} which can be written as $(aa \cup ab \cup ba \cup bb)^*$

2.

We know that if the language $L = \{wbbw : w \in \{a,b\}^*\}$ is intersected with a^*bba^*, which we know to be regular, we get the language $\{a^n bba^n : n \geq 0\}$. If this language is regular, then we know that the pumping lemma will apply. If the pumping lemma applies, then we know that there is some n such that any string longer than n, say x can be broken up into u, v, w such that $|uv| \leq n, |v| > 0, uvw$ is the string, and $uv^m w$ is also in L. However, choosing a string of $aaabbaaa$ leads to a $v = abba$. However, it is quite evident that $aa(abba)^* aa$ is not in the language (because this string contains more than two b's, for instance), and so we must conclude that this language is not regular which implies that L is not regular.

3.

Language $L = \{a^m b^n\}, m \geq 0, n \geq 0$ is regular. However, $L_1 = \{a^m b^m\}, m \geq 0$ is a subset of L and yet it is not regular.