Answers to Test1

The blank lines will be given as a handout sheet in class.

1. (a) regular

(b) Assume L = {p | p is a palindrome over $\Sigma$} Then by the pumping lemma $\exists$ a FSA with n states that recognizes L. Consider w = $a^{n+1}ba^{n+1}$. We need w = xyz ∍ $|xy| \leq n$ and $y \neq \Lambda$. So both x and y must consist of a's and z = $a^{i}ba^{n+1}$ where m > n+1. But then $a^{m}ba^{n+1}$ is not a palindrome.

2. (a) Call the language of equal numbers of a's and b's L. Let M be the language of a*b*. Then $L \cap M$ is regular. But $L \cap M = \{a^n b^n \mid n \geq 0$. Contradiction.

(b) regular.

3.

4.

5. (a + b)*abb

6.

7.

8. false: The set of primes (previously proven not to be regular) is a subset of the integers (previously proven to be regular).

9. true: For any alphabet, $\Sigma$, $\Sigma^*$ is regular.

10. Proof by induction on the length of y. Base |y| = 1.
{wa | a $\in \Sigma$ } has been shown in class to be regular (9/29).
Induction hypothesis: Assume the set if regular for strings y up to length n and consider y' to have length n + 1. Then {wy | |y| = n} is regular by ind. hyp. Now Consider {wy' | where y' = y o a for some a in $\Sigma$ }. Now use the argument as given for the base case.

11. ($\Lambda$ + aa*) (b + ab*).

12. (a) only what it sees as one input symbol.

(b) true: Use a conditional for each state.

(c) False: Consider a program (algorithm) that prints out primes.