Problem Set 3—Due Friday, October 20

Problem 11. Page 74, Exercise 5(b).

Problem 12. Page 77, Problem 8.

Problem 13. Page 77, Problem 10.

Problem 14. Are the following propositions true or false? Support your answers with either proofs or counterexamples.

(a) If $L_1 \cup L_2$ is regular and L_1 is finite, then L_2 is regular.

(b) If $L_1 \cup L_2$ is regular and L_1 is regular, then L_2 is regular.

(c) If $L_1 L_2$ is regular and L_1 is finite, then L_2 is regular.

(d) If $L_1 L_2$ is regular and L_1 is regular, then L_2 is regular.

(e) If L^* is regular then L is regular.

Problem 15. Use the pumping lemma to show that the following languages are not regular.

(a) $L_a = \{0^m 1^n 0^{m+n} : m, n \geq 0\}$.

(b) $L_b = \{0^{2^n} : n \geq 0\}$.

Problem 16. Is the following language regular?

$$L = \{w_1 c w_2 : w_1, w_2 \in \{a,b\}^* : w_1 \neq w_2\}.$$

Prove your answer either way.