Problem Set 8—Due Friday, December 1

Comment. Note the unusual due date, due to Thanksgiving.

Problem 35. Page 183, Problem 3.

Problem 36. Classify the following languages as **decidable**, **enumerable** (but not decidable), **co-enumerable** (but not decidable), or **neither**. Prove all your answers.

- **A.** $L = \{\langle M \rangle : L(M) \cap 0(0 \cup 1)^*1 \neq \emptyset\}$.
- **B.** $L = \{\langle M \rangle :\ L(M)$ is infinite$\}$.
- **C.** $L = \{\langle t \rangle :\ t$ is a "Yes" instance of the tiling problem requiring ≤ 10 different tile types$\}$.
- **D.** $L = \{\langle M \rangle :\ M$ has no state with a "0"-labeled transition$\}$.
- **E.** $L = \{\langle M \rangle :\ M$ never prints a "0" (regardless of the input)$\}$.
- **F.** $L = \{\langle \phi \rangle :\ \phi$ is a Boolean formula which has *no* satisfying assignment$\}$.

Problem 37. Prove that $\leq_{\mathrm{p}}$ is reflexive and transitive, but not necessarily symmetric.

Problem 38. Page 239, Problem 7.12.

Problem 39. Prove that P=NP iff every nontrivial language in NP is NP-complete.[1]

Problem 40. Page 240, Problem 7.21.

[1]The *trivial* languages are $\emptyset$ and Σ^*. The rest are *nontrivial*.