Name: _____

1) (15 pts) Define $SS_{TM} = \{ \langle M_1, M_2 \rangle \mid M_1$ and M_2 are Turing Machines with $L(M_1) \subseteq L(M_2) \}$. Prove that SS_{TM} is undecidable.

2) (20 pts) Recall that E_{LBA} = { <M> | M is an LBA where $L(M) = \emptyset$ }. Prove that $\overline{E_{LBA}}$ is Turing Recognizable. Based on this result as well as the proof in class showing that E_{LBA} is undecidable, as accurately as possible, determine the class of languages to which E_{LBA} belongs.

3) (15 pts) Show that the PCP problem is decidable over a unary alphabet. (Namely, each domino is allow to have only strings comprised of the same character. An example of such a valid set of dominoes not in the language is $\{\left[\frac{111}{11}\right], \left[\frac{1111}{1}\right], \left[\frac{11111}{11}\right]\}$.)