CS303 (Spring 2008) - Assignment 11
Due: 04/16/2008

(1) (a) What does it mean formally when we say that a set X "respects functions"?

(b) What does it mean intuitively?

(c) In general, if f is a function, what does it mean for x to be a fixpoint of f?

(d) In the context of recursion theory, what does it mean, assuming f is a total and recursive function?

(2) Prove that the following sets of programs are undecidable. You can use whatever method you would like to prove it.

(a) USC $= \{P \mid$ Program P outputs 'USC' for each even number $x\}$.

(b) MST $= \{P \mid$ Program P always returns the MST of its input graph $G\}$.

(c) HALT$^+$ $= \{P \mid$ Program P halts when run on P, and contains the statement "y=x+y+z" somewhere$\}$.

(3) Prove that for every two sets X, Y, there is a third set Z such that $X \leq_m Z$ and $Y \leq_m Z$.

(4) (a) Prove that there is a program P which, when given an input number k, prints its own source code k times.

(b) Prove that there are programs P, P' such that P prints the source code of P', and P' prints the source code of P.