

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) $\text{USC} = \{P \mid \text{Program } P \text{ outputs 'USC' for each even number } x\}$.
 - (b) $\text{MST} = \{P \mid \text{Program } P \text{ always returns the MST of its input graph } G\}$.
 - (c) $\text{HALT}^+ = \{P \mid \text{Program } P \text{ halts when run on } P, \text{ and contains the statement "y=x+y+z" somewhere}\}$.
- (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 .