

Problem Set 6 Recursion Theory

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[CT] is *Computability Theory* by Barry Cooper.

1. Exercise 5.3.4 on pg. 79 of [CT]
2. For each e , let T_e denote the Turing-machine with code e . We say that the Turing machines M_x and M_y are equivalent (notation: $M_x \equiv M_y$) if they compute the same function. Show that the machine-equivalence problem is unsolvable, that is, the set $\{(x, y) \mid M_x \equiv M_y\}$ is not computable.
3. While talking about the Busy Beaver function, we proved an easy result showing that every recursive function is dominated by an increasing recursive function. Prove the following more interesting result: if g is a recursive function (in one variable) which is one-to-one and has recursive range, then the range of any recursive function f that dominates g is also recursive.