Posted: Oct 27, 2018
Due: TBA—you have at least three weeks to do the problems

Problem Set No. 2

NB. *All problems are equally weighted and will be assigned a letter grade; an overall letter grade for the paper will be computed using York's 0–9 gpa scale.*

This is not a course on *formal* recursion theory. Your proofs should be informal (but **not** sloppy), correct, and informative (and if possible short). Please do not trade length for correctness or readability.

All problems are from "Theory of Computation".

(1) From Section 2.12: Do 22, 27.

A Note on **Notation differences** between the book and our conventions in class:

In *class* we write (x, y) for *uncoded* pair (two numbers). We write $\langle x, y\rangle$ for *coded* pair, i.e., $2^{x+1}3^{y+1}$.

In particular, in Problem 27, $K_0 = \{(x, y) : \phi_x(y) \downarrow\}$.

In the text we write instead $\langle x, y\rangle$ for an uncoded pair (following modern set theory notation) and invent the notation $[x, y]$ for a coded pair.

Please use the class notation in your answers!

(2) Exhibit a partial computable function f such that the problem "$f(x) \downarrow$" is unsolvable. Justify why your function has the stated here property.

(3) From Section 2.12 also do 42, 44.

(4) From Section 2.12 also do the following **from scratch, without invoking Rice's Lemma!**: 46, 49, 50, 51.