MATH 343, SPRING 2013, ASSIGNMENT 7

DUE THURSDAY MARCH 28, 2013 IN CLASS

Do **any three** of the following four problems. If you do more than three, only the first three will be graded.

(1) Consider the generating tree given by the rule

$$(1; \{k \mapsto (2)(3) \cdots (k)(k+1)\})$$

(a) How many leaves at a given level does this tree have?

(b) We know some objects counted by these numbers; pick one and describe how to view this generating tree as generating these objects

(2) (Ref: Kreher and Stinson, exercise 4.1) Define choice sets and describe backtracking algorithms for the following problems:

(a) Find all self-avoiding walks of length n. (Such a walk is a sequence of steps of unit length, either horizontal or vertical (up/down/left/right = N/S/W/E.) such that no point is visited more than once. There are 4^1 of length 1 (N; S; E; W) and 12 of length 2 ([N,N],[N,E], [N,W], etc. but *not* [N,S] since it revisits the origin).

(b) Find all k-vertex colourings of a graph G. Recall a k-colouring is a graph is an assigment of at most k colours to the vertices of the graph such that adjacent vertices have different colours.

(3) Implement the pruned Knapsack algorithm. Run it on some examples and plot the runtimes as a function of n. Roughly what does the runtime in practice seem to be (use a log plot to see if it is stil exponential...)

(4) (a) Find at least 2 typos in the typed notes.

(b) What section in the typed notes would you most like to see expanded? Why?

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[1]There is an error in the book