Complete any or all of the following questions by 4pm on Tuesday, May 10 for *up to* three points extra credit per problem (as compared to a normal HW problem being worth 5 points). Note that a score of 3 will only be given for answers that are thorough and precise.

Chapter 1

Question 1 (K&T 1.2, p.22)**.**

Question 2 (K&T 1.8, p.27)**.** "Truthfulness" in the Stable Matching Problem.

Chapter 2

Question 3 (K&T 2.1, p. 67)**.** Run time analysis problems.

Question 4 (K&T 2.4, p. 67)**.** Run time analysis problems—ascending order.

Question 5 (K&T 2.7, p. 69)**.** Folk song generator algorithm encoding.

Chapter 3

Question 6 (K&T 3.2, p. 107)**.** Give an algorithm to detect whether a given undirected graph contains a cycle.

Question 7 (K&T 3.4, p. 107)**.** Algorithm for butterfly judgement matchings that is $O(m+n)$.

Question 8 (K&T 3.12, p. 110)**.** Stable Matching Problem for ethnographers.

Chapter 4

Question 9 (K&T 4.8, p. 234)**.** Suppose you are given a connected graph G, with edge costs that are all distinct. Prove that G has a uniquie minimum spanning tree.

Question 10 (K&T 4.16, p. 238)**.** Design an efficient algorithm for a security program designed to track criminal bank accounts.

Question 11 (K&T 4.22, p. 242)**.** Proof that T must be some minimum cost spanning tree for graph G.

Chapter 5

Question 12 (K&T 5.3, p. 152)**.** Bank card fraud detection algorithm in $O(nlogn)$.

Question 13 (K&T 5.5, p. 154)**.** Hidden surface removal—graphics calculation algorithm for only calculating lines that need to be displayed.

Chapter 6

Question 14 (K&T 6.5, p. 316)**.** Algorithm to determine word segmentation in strings without spaces.

Question 15 (K&T 6.21, p. 330)**.** Effecient algorithm to calculate the maximum possible return on investments.

Chapter 7

Question 16 (K&T 7.9, p. 419)**.** Network flow calculation for scheduling patients in disaster to specific hospitals with finite sizes.

Question 17 (K&T 7.15, p. 421)**.** Network flow—algorithm to determine which roommate will be cooking dinner based on their schedules.

Question 18 (K&T 7.51, p. 448)**.** Algorithm to determine who wins in a game of "Kevin Bacon" given two sets of actors for each player.

Chapter 8

Question 19 (K&T 8.10, p. 509)**.** Prove that Strategic Advertising is NP-Complete; design an algorithm that implements Strategic Advertising.

Question 20 (K&T 8.29, p. 519)**.** Prove that Dominating Set is NP-Complete.