CS 401, Homework 1

State all necessary assumptions clearly. Please write legibly or type and print your answers.

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1. There are $2n$ men. In how many ways can they be paired up?

2. Exercise 1.3

3. Exercise 1.4

4. Read and understand Footnote 2 on pages 16-17. Then, show that:

    (a) The graph in Fig 1.3(a) cannot arise as the conflict graph in an instance of Interval Scheduling.

    (b) The graph in Fig 1.3(b) cannot arise as the conflict graph in an instance of Bipartite Matching.

5. Exercise 2.3

6. Exercise 2.4

7. Consider the heap implementation of a priority queue. Let H be a heap on n elements. Prove the following.

    (a) StartHeap(n) takes $O(n)$ time.

    (b) Insert(H, v) to insert element v in H takes $O(\log n)$ time.

    (c) Delete(H, i) to delete the element in heap position i takes $O(\log n)$ time.

8. Exercise 3.1

9. Exercise 3.2

10. Give an implementation of a depth-first search (DFS) of a graph that also prints out the edges of the DFS tree. Make sure to specify the data structures.