

## Spring 2018, CS 401, Homework 1

State all necessary assumptions clearly. Please staple if using multiple sheets of paper. Please write legibly or type and print your answers.

Due date: Feb 12, 2018, 12:00 noon, hard-copy submission in class.

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. Problem 3.1
9. Problem 3.2