1. Suppose the following elements are inserted into an empty pairing heap (as described in class) in the order given: (1, 4.5), (2, 1.4), (3, 6.2), (4, 5.1), (5, 7.5), (6, 9.6), (7, 3.3), (8, 8.4), (9, 2.0). Each element is written in the form (id, priority).

   a. Show the pairing heap after the above 9 insertions.
   
   b. Show the pairing heap after a deletemin.
   
   c. Show the pairing heap after the priority of 7 is decreased to 2.2.
   
   d. Show the pairing heap after a second deletemin.
   
   e. Show the pairing heap after a third deletemin.

2. Consider the following two stack operations, push-item, and pop-all, where it is understood that push-item takes 1 unit of time, and pop-all takes $h + 1$ units of time, where $h$ is the current number of items in the stack. The pop-all operation renders the stack empty. Choose an appropriate potential function to demonstrate that the amortized costs of these operations are 2 for push-item, and 1 for pop-all.

3. Two finite state machines are shown below as graphs. Each edge is labeled with the cost of the associated transition. Determine for each machine the minimum constant that gives a valid amortized cost for a transition, assuming that in both cases the initial state is given by A.