1. Short Answer
   (2 points each)
   True or False: (circle one)

(a) **True or False** Kruskal’s and Prim’s algorithms are both greedy algorithms. **Solution:** True

(b) **True or False** In Union-Find with path compression, if we do two Find-Set(x) operations back to back, the second operation will take $O(1)$ time. **Solution:** True: since x and all its ancestors become children of the root after the first operation.

(c) **True or False** Kruskal’s and Prim’s algorithms both use the Union-Find data structure. **Solution:** False

(d) **True or False** If an operation takes $O(1)$ amortized time, then that operation takes $O(1)$ worst case time. **Solution:** False: The worst case time could be larger

(e) **True or False** If an operation takes $O(1)$ worst case time then that operation takes $O(1)$ amortized time. **Solution:** True

(f) **True or False** The greedy algorithm for 0-1 knapsack always finds an optimal solution. **Solution:** False

(g) **True or False** The greedy algorithm for fractional knapsack always finds an optimal solution. **Solution:** True

(h) **True or False** An edge $x$ is a light edge for some cut which respects $A$ if $x$ is safe for $A$. **Solution:** False - see the hw problem on this

(i) **True or False** An edge $x$ is safe for some edge set $A$ if $x$ is a light edge for some cut which respects $A$. **Solution:** True

(j) **True or False** If $X$ and $Y$ are sequences that both begin with the character a, then some longest common subsequence of $X$ and $Y$ begins with the character a. **Solution:** True