Hints to text Problems

4.7 Given a tree \( T = (V, E') \), \( E' \subseteq E \) with root node as \( s \), compute the distance to all vertices using the tree edges. For the remaining edges \( E - E' \), relax and see if the shortest paths from \( s \) can be improved.

4.9 You need to worry for a negative cycle involving \( s \).

4.10 Easy

4.13 (a) Given \( G \), eliminate all edges of length \( 1 \) determined by the fuel tank capacity. Check if there is a connected component containing \( s \). Linear time \( \Theta(VE) \).

(b) Use binary search approach using the above approach.

4.14 Shortest path from \( x_1 \) to \( x_2 \) through \( x_0 \): This path is in \( x_1 \) shortest path from \( u_0 \) to \( x_1 \) in \( G \).

From \( u_0 \) to \( x_1 \) in \( G \).

Reverse \( G \).
4.17 Discussed in class

4.20 Graph is undirected.
1. Compute shortest path tree from S to G and from t to G.
2. For each edge e, determine the shortest path from S to t via e.

5.5 This question was asked in Quiz 3

5.7 We can change the weight of each edge to -w. The minimum spanning tree of the resulting graph G' is the maximum spanning tree of G.

5.8 A Quiz 3 question

5.11 Easy: you should make sure that you understand

5.12 Flip this picture.

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5.13 Huffman encoding. We have not discussed it in class. You should read yourself.

5.23 a) no change (b) change, can be updated in linear time $O(n)$

c) no change (d) change: remove $e$ and find the smallest cost edge across $E$, resulting in $\text{our}$...
Hints to textbook problems

6.2. \( D(i) \): minimum total penalty to get to hotel \( i \).

We want \( D(n) \).

\[
D(i) = \min \left \{ \sum_{j \neq i} D(j) + (200 - \text{distance}(j, i))^2 \right \}
\]

We stop at \( i \). The previous stop was \( j \).

6.3. \( D(i) \): max profit can be obtained from locations 1 through \( i \).

If a restaurant is opened at \( i \), there cannot be any opened restaurant within \( k \) miles of \( i \). For any \( j \) location, \( \text{dist}(j, i) \geq k \).

The profit of opening a restaurant at \( ij \) is \( D(j) + p_i \).

6.8. Discussed in the class

6.10. \( L(i, j) \): probability of obtaining exactly \( j \) heads in \( i \) tossings, \( i \geq j \).

On the \( i \)th toss, the probability of a head is \( p_i \) and the probability of not a head is \( 1 - p_i \).
6.12 A triangulation.

A(i, j) : optimal triangulation of convex polygon with vertices \(v_i, v_{i+1}, \ldots, v_j\).

See the figure: \(A(i, j) \geq A(i, k) + A(k, j) + \overline{v_i v_j}\) for \(i < k < j\).

6.17 It is very similar to the coin change problem of homework #6.

6.18 It is very similar to the knapsack problem.

6.22 The problem is very similar to the knapsack problem.