Practice questions for the final exam

1. Look over previous homeworks and practice questions.

2. Try exercises 3.23, 4.3, 4.15, 5.3, 5.9(e,f,g), 6.19, 7.4, 7.18, 7.21, 7.22, 8.1, 8.16.

3. Consider the following variant of the CLIQUE problem.

   **Max Clique**
   
   *Input:* An undirected graph $G$
   
   *Output:* The largest clique in $G$ (i.e. return the actual subset of vertices)

   Show that Max Clique reduces to CLIQUE.

4. Here are two related problems.

   **Hamilton Path**
   
   *Input:* An undirected graph $G = (V, E)$
   
   *Question:* Does $G$ have a path which touches each vertex exactly once?

   **Taxicab Ripoff**
   
   *Input:* An undirected graph $G = (V, E)$ with positive edge weights $w_e$; two nodes $s, t \in V$; an integer $k$
   
   *Output:* Is there a simple path (i.e. no repeated vertices) from $s$ to $t$ such that the total length of the path is at least $k$?

   Show that Hamilton Path reduces to Taxicab Ripoff.

5. The Degree-Bounded Spanning Tree problem is the following.

   *Input:* An undirected graph $G = (V, E)$ with edge weights $w_e$; an integer $k$
   
   *Question:* Does $G$ contain a spanning tree in which each node has degree $\leq k$?

   Show that this problem is as hard as Hamilton Path.