1. (12 pts) Answer the following true or false questions in your blue book. There is no partial credit.

   (a) **T** or **F**: In every cycle graph C_n, a maximal matching is always a maximum matching.

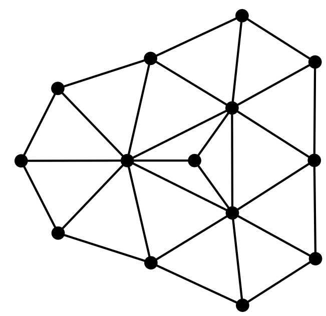
   (b) **T** or **F**: There is a closed knight's tour on a 4×5 rectangular board.

   (c) Let G be a connected graph with degree sequence $(7, 5, 4, 4, 4, 4, 2, 2, 2, 2)$.
   T or **F**: It is possible to create a drawing of G without picking up your pencil.

   (d) **T** or **F**: The cube graph is self-dual.

2. (8 pts) Determine the chromatic number of this graph Q:

   [*Hint: Use a known theorem, do not actually color Q.*]



3. (10 pts) Show that the thickness of K_6 is 2. Use an argument that involves a decomposition of K_6.

   [***Important:*** *DO NOT use a formula.*]

4. (10 pts) Let $N = (V, E)$ be a network with capacities c_e on every edge $e \in E$. Suppose that φ is a flow on N and that for a subset $X \subset V$, $[X, X^c]$ is an st-cut in N. Explain precisely why the throughput of φ must be less than or equal to the capacity of $[X, X^c]$.

   [*In this problem φ is not necessarily a max flow, nor is $[X, X^c]$ a min cut.*]

5. (10 pts) Use the Hungarian algorithm to find a maximum matching on the graph below, starting with the given matching.

   [*Feel free to use the extra copies of the graph that are provided.*]