

Do 5 of the following problems. Words like “construct”, “show”, “obtain”, “determine”, etc, explicitly require proof. Full credit for most problems requires proof of the statements you make. Use *sentences*; you cannot give a proof without words. Results covered in class can be used without proof (if stated correctly).

1. A *graph homomorphism from G to H* is a function $f: V(G) \rightarrow V(H)$ such that if x, y are adjacent vertices in G , then $f(x), f(y)$ are adjacent vertices in H .
 - (a) Fix t . Describe all of the graphs G such that there exists a homomorphism from G to K_t . (To get started, see what happens with K_2 and K_3 .)
 - (b) Let $G \leq H$ if there exists a homomorphism from G to H . Does \leq define a partial order on graphs?
2. 1.1.19
3. (a) Determine the automorphism group of the Petersen graph.
(b) 1.1.25. (Note that this does not follow from part a.)
4. 1.1.30. What do the entries of A^k mean, where $k \geq 0$ and A is the adjacency matrix?
5. 1.1.31
6. 1.1.38