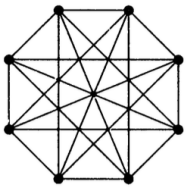
# HW 1

**Your Name goes here**

Due: Fri, 27 Jan 2023 (new and improved)

Key from text:
(−) = easier,
(+) = harder,
(!) = useful or instructive,
(*) = uses optional material

**1.1.16.** Determine whether the two graphs below are isomorphic.



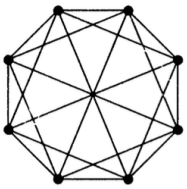
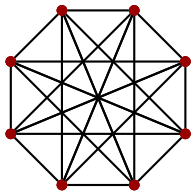


Figure 1: Import screenshots



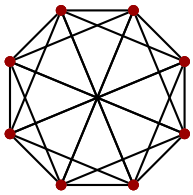
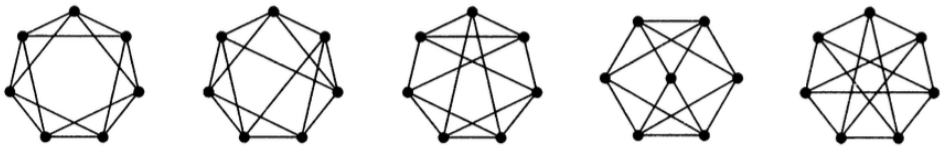


Figure 2: Create images with tikz

**Solution:** .....

Put your solution here. It doesn't have to be blue ☺. You can also choose your delimeter: ♠ ="it is what it is", ♡ ="I love it", ♣ ="it beat me up", ♢ ="it's a gem". Note that they are not mutually exclusive. ♠♡♣♢

**1.1.22.** (!) Determine which pairs of graphs below are iosomorphic, presenting the proof by testing the smallest number of pairs.



**1.1.23.** In each class below, determine the smallest $n$ such that there exist nonisomorphic $n$-vertex graphs having the same vertex degree sequence.

(a) all graphs, (b) loopless graphs, (c) simple graphs

**1.1.25.** (!) Prove the Petersen graph has no cycle of length 7.

**1.1.33.** For $n = 5$, $n = 7$, and $n = 9$, decompose $K_n$ into copies of $C_n$.

**1.1.35.** (!) Prove that $K_n$ decomposes into three pairwise-isomorphic subgraphs if and only if $n+1$ is not divisible by 3. (Hint: For the case where $n$ is divisible by 3, split the vertices into three sets of equal size.)

**1.1.38.** (!) Let $G$ be a simple graph in which every vertex has degree 3. Prove that $G$ decomposes into claws if and only if $G$ is bipartite.