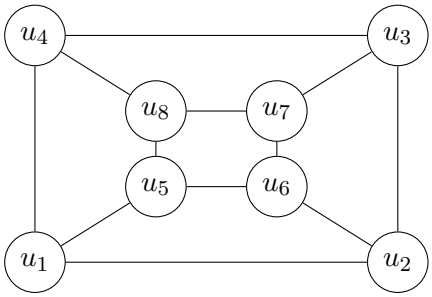
Directions: You may work to solve these problems in groups, but all written work must be your own. **Show your work**; See "Guidelines and advice" on the course webpage for more information.

1. Let G be the following graph.



   (a) How many 4-cycles are in G?

   (b) How many 8-cycles are in G? Draw them all. Hint: there are the same number of 4-cycles as 8-cycles.

   (c) Find an induced 6-cycle in G.

2. Let $m \geq 2$. How many paths on m vertices does K_n contain?

3. Let G be the graph whose vertices are the subsets of $\{1, 2, 3, 4, 5\}$ of size 2 with two vertices adjacent if and only if they are disjoint. For example, $V(G) = \{\{1, 2\}, \{1, 3\}, \{1, 4\}, \{1, 5\}, \{2, 3\}, \ldots, \{4, 5\}\}$; we have that $\{1, 2\}$ and $\{1, 4\}$ are not adjacent, but $\{1, 2\}$ and $\{3, 5\}$ are adjacent. Show that G is the Petersen graph.

4. Decide whether the following pairs of graphs are isomorphic. If they are isomorphic, give the function that establishes the isomorphism. If not, explain why.