Math 3260, W20. Assignment #1. Due date: January 28, 11:59pm.
Late assignments are not accepted. Trying to google the answers is not a good idea.

(1) (10pts) How many edges does the complete bipartite graph $K_{r,s}$ have? Justify your answer.

(2) (a) (5pts) Clearly state for what values of $n \geq 1$ is there a simple 3-regular graph with $n$ vertices.
    (b) (5pts) For those values of $n$ for which you claimed that there is no simple 3-regular graph with $n$ vertices, prove your claim.
    (c) (10pts) For those values of $n$ for which you claimed that there is a simple 3-regular graph with $n$ vertices, describe it. You will have to describe an infinite family of graphs. You can use graphs that we defined in class as building blocks.

(3) (a) (7pts) Prove that any two connected, 2-regular graphs with the same number $n \geq 3$ of vertices are isomorphic. (This means that you need to do the following: Assume $G$ and $H$ both have $n$ vertices, are connected, and 2-regular. From this data, construct an isomorphism between $G$ and $H$. Since $C_n$ has all these properties, you may as well assume that $G$ is $C_n$ (why is this?).)
    (b) (8pts) Find two connected, 3-regular, simple graphs with 8 vertices that are not isomorphic. (This means that you have to describe two such graphs and prove that they are not isomorphic.)

(4) (10pts) Prove that every cube $Q_k$ is bipartite.