

MATH 113: DISCRETE STRUCTURES
HOMEWORK DUE MONDAY WEEK 8

Problem 1. A graph is k -regular if each of its vertices has degree k .

- (a) Draw a 3-regular graph on 6 vertices.
- (b) Prove that there are no 3-regular graphs on 5 vertices.

Problem 2. If G is a graph and e is an edge of G , define $G - e$ to be the graph obtained from G by removal of e (but not the endpoints of e). Recall that to say a graph is *connected* means that every pair of its vertices can be connected by a path.

- (a) Give an example of a connected graph G with an edge e such that $G - e$ is not connected.
- (b) Suppose G is a connected graph and e is an edge of G that is part of a cycle. Prove that removal of e does not disconnect the graph. Your proof is required to start with the line: "Let u and v be vertices of G ." It should then show there must be a path in $G - e$ connecting u and v .