CS 180 Homework 3

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1. Exercise 10 Page 110

2. Exercise 6 on page 108

3. Exercise 7 on page 108

Let G be a graph on n nodes, where n is an even number. If every node of G has degree at least n/2, then G is connected.

We will prove this is true by indirect proof. Assume there exists arbitrary node and in for which there exists no path, meaning is not connected.

As required, the degree of and is at least . Since we assume that and are not connected, then all the nodes connected to a cannot also be connected to b (if there was a node x that was connected

to and , then there would be a path and the graph would be connected). Therefore

we have nodes in the component containing node and nodes in the component containing node , since and have degree of at least . The comes from the fact that we must also add node or into the count. This would mean we have at least nodes in the graph, but since there are only n nodes in the graph, this is a contradiction.

For this reason, must be connected if each vertex has degree of at least .

4. Exercise 3 on page 189

5. Exercise 6 on page 191

6. (a) Can you design an algorithm that nds the longest path in a directed

graph (DG)? (you can use an edge at most once)? If yes, describe

the algorithm and analyze its time complexity.

(b) Can you design an algorithm that nds the longest path in a directed

acyclic graph (DAG)? (you can use an edge at most once)? If yes,

describe the algorithm and analyze its time complexity.