Activity Sheet 2

Reporter :

Speaker :

Section 1.3

1. Consider the complete graph in 5 vertices. In each of the following explain your reasoning.

   a. Determine how many path subgraphs of this graph there are (these would be identical to P_1, P_2, P_3 or P_4, count separately for each case).

   b. Determine how many cycle subgraphs of this graph there are (C_3 or C_4, count separately for each case).

c. Determine how many complete proper subgraphs of this graph there are (K_1 through K_3, count separately for each case).

2. Can the complement of a path/cycle graph be a path/cycle graph? Explain (there are 4 combinations in this question).

3. Consider a bipartite graph of order n. What is the largest possible value for the size of such a graph? Prove your answer (you may end up using some basic calculus).

4. Prove that for every n, the n-th cube is bipartite. You will likely need to do induction on n to formally prove it, but try to get some intuition by manually trying the cases up to $n \leq 3$.

Section 1.4

4. Consider a digraph whose vertices are the courses offered in a department (say mathematics, but your answers below should apply to *any* department), and where an arc/edge from u to v indicates that the course v has the course u as a prerequisite.

   a. Must such a digraph be **oriented**? Explain.

   b. What does it mean to have multiple edges *from* the same vertex? What does it mean to have multiple edges *to* the same vertex?

   c. Can such a digraph have a directed cycle in it?

   d. What practical significance does the diameter in such a digraph have?