

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.
- Must such a digraph be **oriented**? Explain.
 - What does it mean to have multiple edges *from* the same vertex? What does it mean to have multiple edges *to* the same vertex?
 - Can such a digraph have a directed cycle in it?
 - What practical significance does the diameter in such a digraph have?