

HOMEWORK 2 (MATH 180, WINTER 2021)

Read: MN (Second ed.), sections 4.1 – 4.3.

Solve: Exercises in MN:

1a, 2, 3a, 6 in §4.1,

1, 2, 9a, 10 in §4.2

1, 4, 5, 6, 7, 13, 14, 15a in §4.3

Additional exercises:

I. Draw all (non-isomorphic) graphs on 6 vertices with 6 edges. Explain why they are not isomorphic.

II. Find the number of subgraphs of K_9 isomorphic to each of the following: O_3 , K_4 , P_5 , C_6 , $K_{2,5}$, $K_{5,5}$.

III. Describe all graphs (up to isomorphism) which contain no subgraph isomorphic to P_3 .

IV. For each of the following sequences decide if it is a score of a graph. If YES, draw the graph. If NO, argue why not.

(6, 6, 6, 2, 2, 2, 2, 2, 2)

(5, 5, 5, 5, 1, 1, 1, 1, 1)

(7, 7, 7, 7, 1, 1, 1, 1)

(6, 6, 6, 6, 4, 3, 2, 1)

V. Suppose graph G has score (12, 10, 8, 8, 8, 8, 8, 8, 8, 8, 8, 8, 8, 8, 8).

a) Prove that G has a subgraph isomorphic to P_9 .

b) Prove that G has a subgraph isomorphic to C_{16} .

This Homework is due Wednesday Jan 20, at 8:59 am (right before class). Please read the collaboration policy on the course web page. Make sure you write your name in the beginning and your collaborators' names at the end. Box all answers. Remember that answers are not enough, you also need to provide an explanation exhibiting your logic. The explanation can be brief, but must indicate all logical steps.

P.S. Each item above has the same weight.