Assignment 9 Part 1

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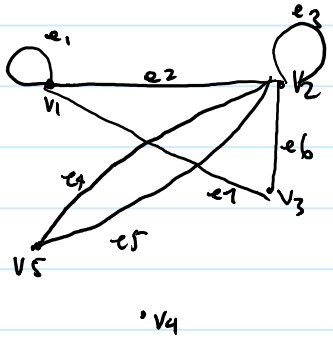
10.1 - 9



i Find all edges that are incident on v_1

e_1 e_2 e_4

ii Find all vertices that are adjacent to v_3

v_1 v_2

iii Find all edges that are adjacent to e_1

e_2 e_7

iv Find all loops

e_1 e_3

v Find all parallel edges

e_4 e_5

vi Find all isolated vertices

v_4

vii Find the degree of v_5

$\deg(v_3) = 2$

viii Find the total degree of the graph

$\deg(v_1) = e_1 + e_2 + e_4 = 2+1+1 = 4$

$\deg(v_2) = e_3 + e_2 + e_4 + e_5 + e_6 = 2+1+1+1+1 = 6$

$\deg(v_3) = e_6 + e_7 = 1+1 = 2$

$\deg(v_4) = 0$

$\deg(v_5) = e_4 + e_5 = 1+1 = 2$

total degree = 14

or total degree of G = 2·(num of edges of G)

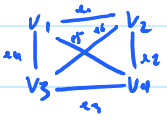
= 2·7

$= 2 \cdot 7$

$= 14$

10.1 - 27b In a group of 4 people, is it possible for each person to have exactly 3 friends? Why?

Yes it is possible. Suppose we have four vertices that represent 4 people if each had three edges (representing a friendship) we would have a total of 12 deg



v_1 { e_1 e_5 e_4 }

v_2 { e_1 e_6 e_2 }

v_3 { e_4 e_5 e_3 }

v_4 { e_2 e_3 e_5 }

10.1 - 44 a) In a simple graph must every vertex have degree that is less than the number of vertices in a graph?

Yes because a simple graph does not contain loops or parallel edges the maximum amount of edges a vertex can have is total vertices -1

$\deg(v_1) = 1 \quad \deg(v_2) = 1$

b) Can there be a simple graph that has four vertices each with a different degree?

NO! Lets say that we have a simple graph with four vertices. Because it is a simple graph the highest degree a point can have is $V-1 = 3$. The lowest possible degree is 0. If a vertex "A" has 3 degs, it means that the remaining 3 vetices have a degree > 1 since "A" created an edge with all of the vertices

c) Can Here be a simple graph that has n vertices all of different degrees.

NO! Suppose we have a graph of size n (where $n \geq 2$). The possible degrees for all vertices are $0, 1, 2, 3 \ldots n-1$. If a vertex has a degree of $n-1$, it means that no vertices can have a degree of 0.