DISCRETE MATHEMATICS

PRACTICE CLASS 2

Group: ARA

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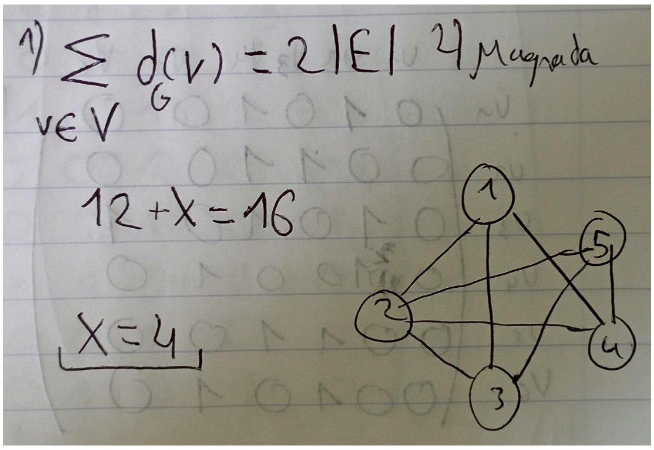
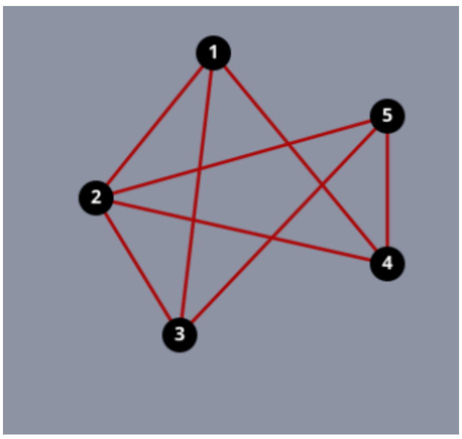
Problem 1

i)



ii)



Problem 2

We have a graph with 15 edges, 3 vertices of degree 4 and all others of degree 3.

$\sum d(v) = 2 \cdot E$ // $4 \cdot 3 + X = 30$

$X = 18$ // ~~18~~

X means the num of vertices ~~and~~ multiplied by their degree, we know that the degree is 3, then: $\frac{18}{3} = 6$, we have ~~3~~ 6 ~~vert~~ more vertices, then we have 9 vertices.

Problem 3

3) $E = 5$ with vertices which degree is 3 or 2

$X \cdot 3 + y \cdot 2 = 10$ // $3x + 2y = 10$

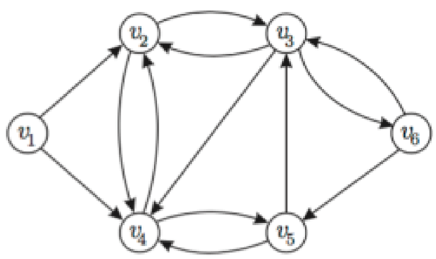
We have to possibilites:

$x = 2$ // $x = 0$ We get these two

$y = 2$ // $y = 5$ possible combinations

because the degree can't be decimal and knowing that we have to have vertices with degree 2 and vertices with degree 3, we ~~ha~~ got: $x = 2$ and $y = 2$

Problem 4



i)

Adjacency matrix

Vertices	1	2	3	4	5	6
1	0	1	0	1	0	0
2	0	0	1	1	0	0
3	0	1	0	1	0	1
4	0	1	0	0	1	0
5	0	0	1	1	0	0
6	0	0	1	0	1	0

ii) The outdegree of v3 is 3 because in his column we have three ones.

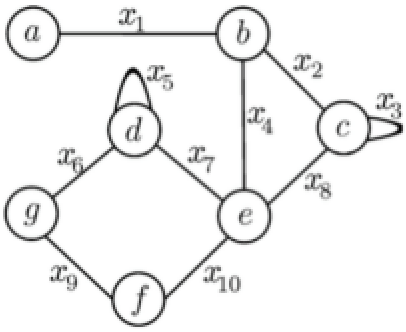
iii)

$$\begin{pmatrix} 0 & 1 & 1 & 1 & 1 & 0 \\ 0 & 2 & 0 & 1 & 1 & 1 \\ 0 & 1 & 2 & 1 & 2 & 0 \\ 0 & 0 & 2 & 2 & 0 & 0 \\ 0 & 2 & 0 & 1 & 1 & 1 \\ 0 & 1 & 1 & 2 & 0 & 1 \end{pmatrix}$$

There are to possible walks of length 2.

iv) Γ(v1) = 2 Γ(v2) = 2 Γ(v3) = 3 Γ(v4) = 2
Γ(v5) = 2 Γ(v6) = 2
Γ-1(v1) = 0 Γ-1(v2) = 3 Γ-1(v3) = 3 Γ-1(v4) = 4
Γ-1(v5) = 2 Γ-1(v6) = 1

Problem 5



i)

Problem 5

1)

$$
\begin{array}{c}
 \\ a \\ b \\ c \\ d \\ e \\ f \\ g
\end{array}
\begin{array}{c}
\begin{array}{ccccccc} a & b & c & d & e & f & g \end{array} \\
\begin{pmatrix}
0 & 1 & 0 & 0 & 0 & 0 & 0 \\
1 & 0 & 1 & 0 & 1 & 0 & 0 \\
0 & 1 & 2 & 0 & 1 & 0 & 0 \\
0 & 0 & 0 & 2 & 1 & 0 & 1 \\
0 & 1 & 1 & 1 & 0 & 1 & 0 \\
0 & 0 & 0 & 0 & 1 & 0 & 1 \\
0 & 0 & 0 & 1 & 0 & 1 & 0
\end{pmatrix}
\end{array}
$$

ii)

$$
\begin{pmatrix}
1 & 0 & 1 & 0 & 1 & 0 & 0 \\
0 & 3 & 3 & 1 & 1 & 1 & 0 \\
1 & 3 & 6 & 1 & 3 & 1 & 0 \\
0 & 1 & 1 & 6 & 2 & 2 & 2 \\
1 & 1 & 3 & 2 & 4 & 0 & 2 \\
0 & 1 & 1 & 2 & 0 & 2 & 0 \\
0 & 0 & 0 & 2 & 2 & 0 & 2
\end{pmatrix}
$$

The elements are the number of walks of length 2.

iii)

3) $$\begin{pmatrix} 0 & 3 & 3 & 1 & 1 & 1 & 0 \\ 3 & 4 & 10 & 3 & 8 & 1 & 2 \\ 3 & 10 & 18 & 5 & 11 & 3 & 2 \\ 1 & 3 & 5 & 16 & 10 & 4 & 8 \\ 1 & 8 & 11 & 10 & 6 & 6 & 2 \\ 1 & 1 & 3 & 4 & 6 & 0 & 4 \\ 0 & 2 & 2 & 8 & 2 & 4 & 2 \end{pmatrix}$$

There is only one path of d to a.

iv)

4) $$\begin{array}{c} \\ a \\ b \\ c \\ d \\ e \\ f \\ g \end{array} \begin{array}{c} \begin{array}{cccccccccc} x_1 & x_2 & x_3 & x_4 & x_5 & x_6 & x_7 & x_8 & x_9 & x_{10} \end{array} \\ \begin{pmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 1 & 1 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 1 & 1 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 1 & 0 \end{pmatrix} \end{array}$$

v) a: x1 c: x2,x3,x8 e: x4,x7,x8,x10
b: x1,x2,x4 d: x5,x6,x7 f: x9,x10 g: x6, x9