(1.1) a) A, B – finite sets
$|A \times B|$ – number of elements in cart product

$$\wp(A \times B) = 2^{|A \times B|}$$

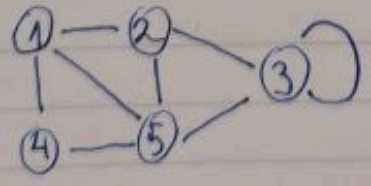
b)
$M = \{1, 2, \ldots 8\}$

is-divisor-of relation:
$(1,2), (1,3), (1,4), (1,5), (1,6), (1,7), (1,8)$
$(2,2), (2,4), (2,6), (2,8)$
$(3,3), (3,6)$
$(4,4), (4,8)$
$(5,5), (6,6), (7,7), (8,8)$

c) can these relationships be modeled as function / relation

- child-mother relationship (function)
is-uncle-of relationship (relation)
relationship between students - enrolment num. (function)
- " - - " - - courses (relation)

(1.2)



a) $G = (V, E)$
$V = \{1, 2, 3, 4, 5\}$
$E = \{(1,2), (1,4), (1,5), (2,5), (2,3), (3,3), (3,5), (4,5)\}$
// $(a,b) = (b,a)$ - note because it's undirected graph

b)

	1	2	3	4	5
1	0	1	0	1	1
2	1	0	1	0	1
3	0	1	1	0	1
4	1	0	0	0	1
5	1	1	1	1	0

c)
1 [2,4,5]
2 [1,3,5]
3 [2,3,5]
4 [1,5]
5 [1,2,3,4]

d) Because it's undirected graph, we can just count ones in node's row (for node n we look at n-th row) and if there is one in G_{nn} field, we count it twice.

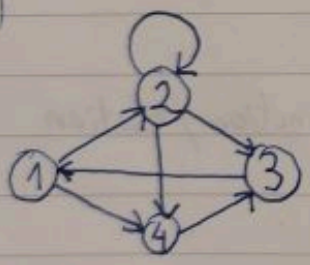
e) We count how many nodes are there in a list of specific node and if there is the same node number as the one we are looking for, we count it twice (self loop is counted twice)

1.3) $G=(V,E)$

$V=\{1,2,3,4\}$

$E=\{(1,2),(1,4),(2,2),(2,3),(2,4),(3,1),(4,3)\}$

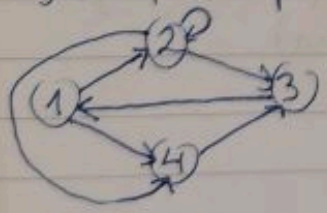
a)



b) indegree of vertex 2: 2 ; (1,2), (2,2)

outdegree of vertex 2: 3 ; (2,4), (2,3), (2,2)

c) yes, it is planar:



4-1 ✓
4-2 ✓
4-3 ✓

1→2 ✓ 2-1 ✓ 3-1 ✓
1→3 ✓ 2-3 ✓ 3-2 ✓
1→4 ✓ 2-4 ✓ 3-4 ✓

e) acyclic?

No it is not because it contains cycle (1→4→3→1)

d) graph is strongly connected because there is a path from every node to every other node

(1.5)

a) example: h - g - f - a - g - d - h - e - b - a - c - d - b
My logic: if a node has odd degree, the path HAS to either start or finish at that node. In this graph, we have 2 nodes with odd degree so it's possible if we start at one and finish at other

b) No, it doesn't have to exist Euler tour/path because more than 2 nodes might have odd degree and still be complete.