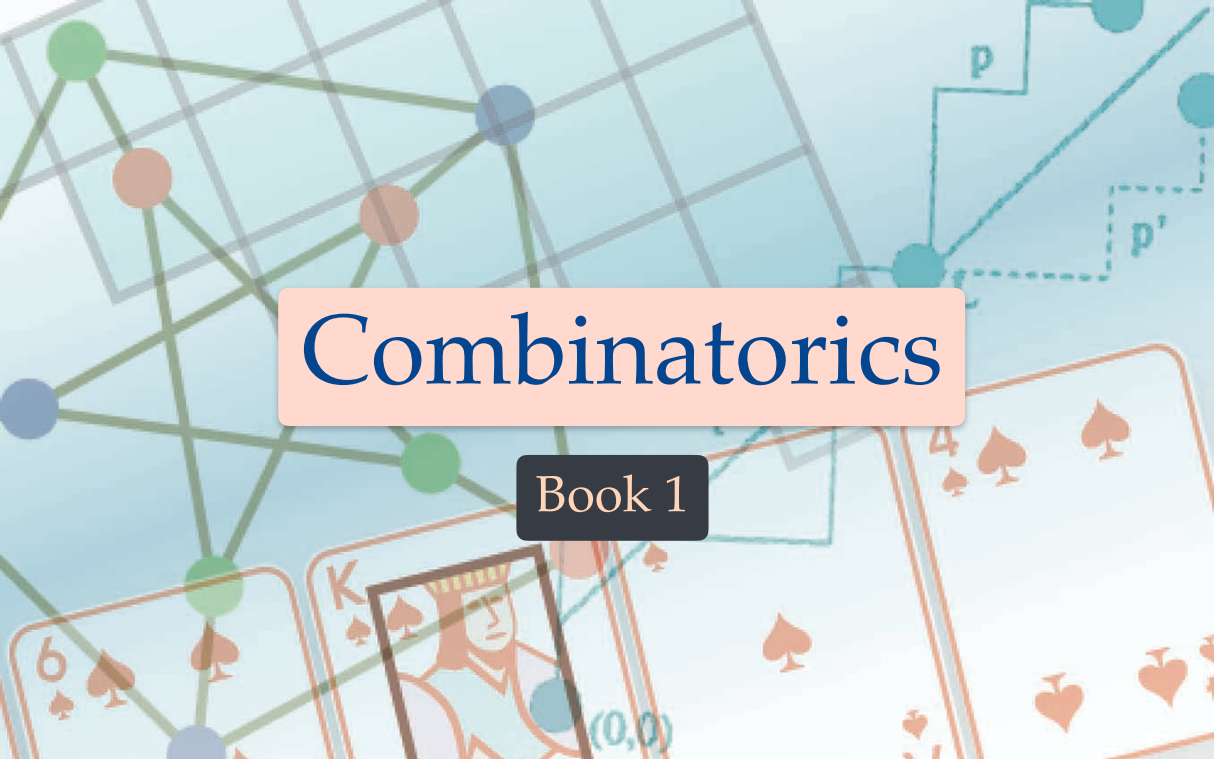
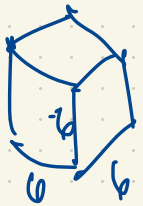


Combinatorics

Book 1

Eric

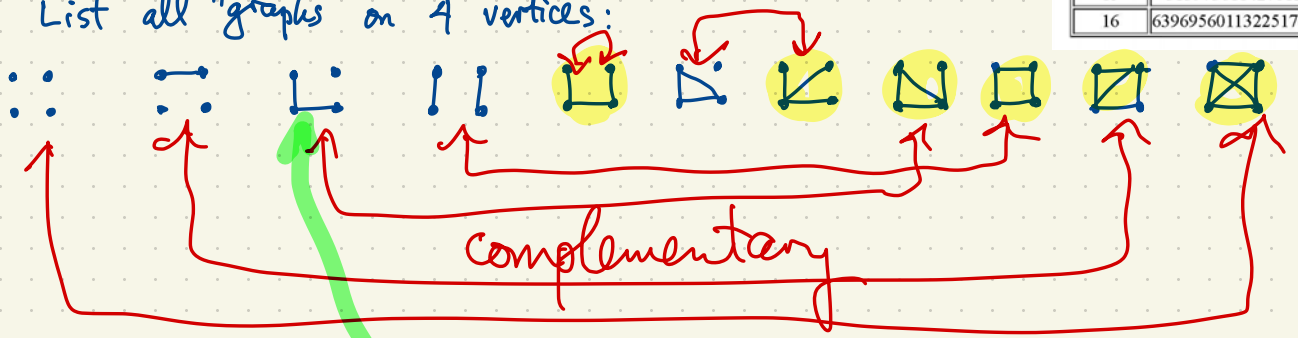
RH 

$6^3 = 216$

#vertices	Connected graphs	All graphs
1	1	1
2	1	2
3	2	4
4	6	11
5	21	34
6	112	156
7	853	1044
8	11117	12346
9	261080	274668
10	11716571	12005168
11	1006700565	1018997864
12	164059830476	165091172592
13	50335907869219	50502031367952
14	29003487462848061	29054155657235488
15	31397381142761241960	31426485969804308768
16	6396956011322517617627 7	6400101570452755789 4928

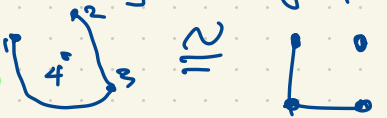
Ordinary / Simple Graph on n vertices/nodes

Eg. List all 11 graphs on 4 vertices:



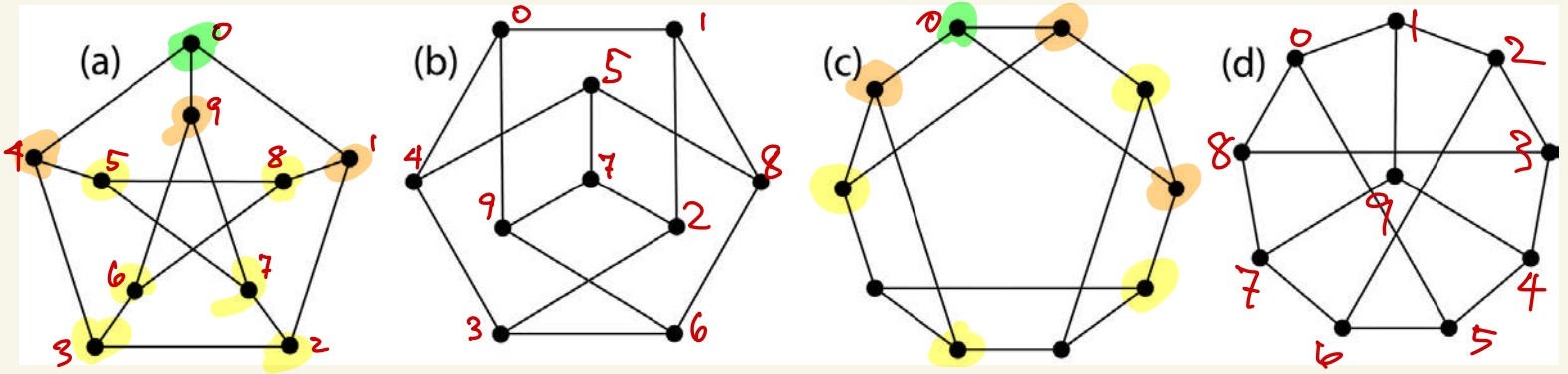
A graph of order n is a pair $G = (V, E)$ where V is a set of n vertices and E is a subset of pairs $\{v, w\}$ where $v \neq w$, $v, w \in V$. and edges $\{1,3\}, \{2,3\}$ can be illustrated

Eg. the graph with vertices 1, 2, 3, 4



$\simeq$

(the two graphs are isomorphic).



Of these four graphs, which one is not isomorphic to the others?

Graphs (a), (b) are isomorphic. Graph (c) is not isomorphic to (a) or (b) because graph (a) has diameter 2: any two vertices are at distance at most 2 apart. However, graph (c) has diameter 3.

An automorphism (symmetry) of a graph is an isomorphism from the graph to itself.

An isomorphism from graph (a) to graph (d) is the map with table of values

vertex in (a)	vertex in (d)
0	0
1	
2	2
3	3
4	
5	
6	
7	
8	
9	9