

Ch. 0 - Prerequisite Knowledge

Sets

$\{a, b, c\}$ = unique, order does not matter

so $\{a, a\} = \{a\}$

$\mathbb{N}$ = natural numbers = $\{1, 2, 3, \dots\}$

$\mathbb{Z}$ = integers = $\{\dots -3, -2, -1, 0, 1, 2, 3, \dots\}$

$\emptyset = \{\}$ = empty set

$\cup$ = union (like an 'or' $\vee$ operator in Propositional logic)

$\cap$ = intersection (like an 'and' $\wedge$ operator)

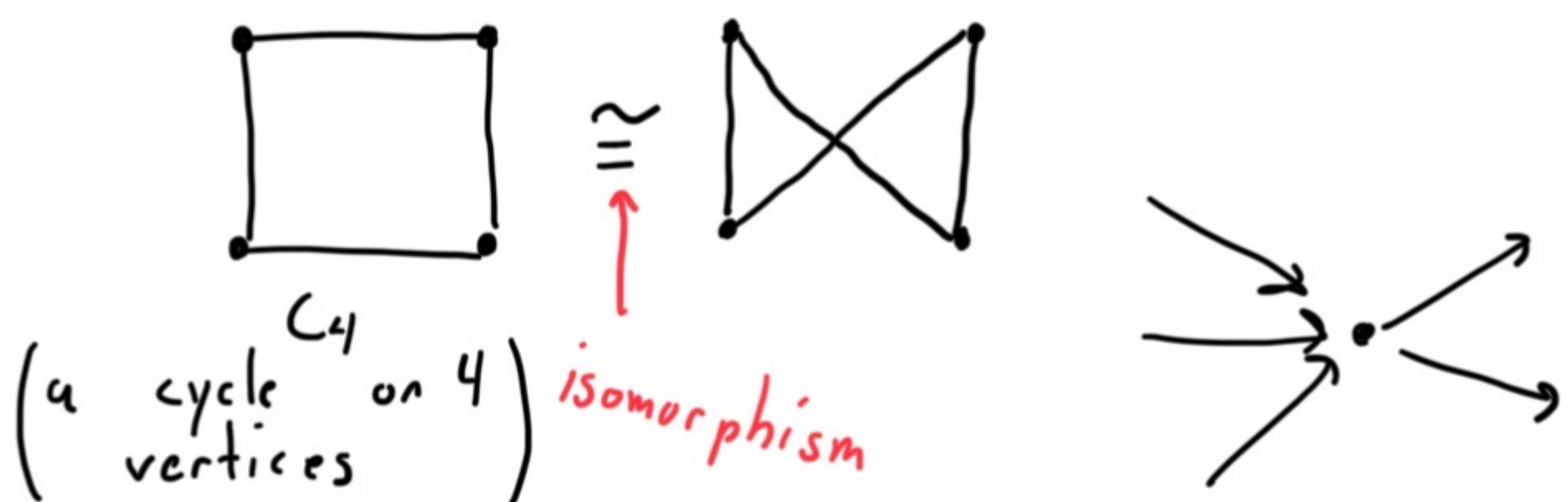
$\bar{A}$ = complement of set A

$(4, 6, 4)$ = tuple = order matters, can repeat

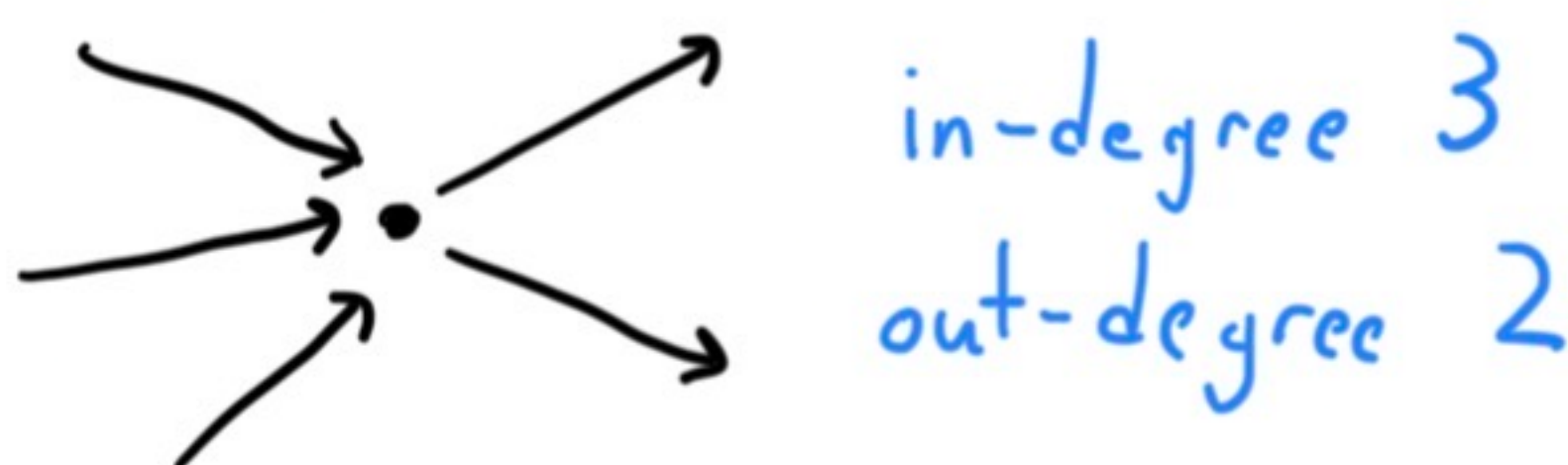
$A \setminus B$ = A set minus B

Graphs

Let $G = (V, E)$ where V is a set of vertices & E is a set of edges.



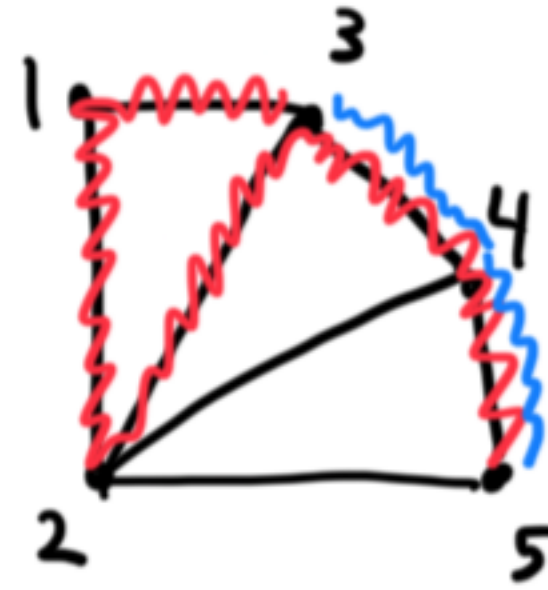
• can be directed or undirected



- subgraphs - $H \subseteq G$ (H is a subgraph of G)



- walk - a sequence of connected vertices



There exists a walk

$$w = \langle 3, 1, 2, 4, 5 \rangle$$

... Path

$$p = \langle 3, 4, 5 \rangle$$

- path - a walk without repeated vertices

Strings

Σ = alphabet = a set of symbols
(finite)

i.e. let $\Sigma = \{a, b, c, d\}$

- string - a finite sequence of symbols

i.e. let $w = \text{baccada}$

then $|w| = 7$ $|\epsilon| = 0$

(cardinality/size)

- ϵ (epsilon) - empty string

- concatenate strings

let $x = \text{bac}$ and $y = \text{cada}$

then $xy = \text{baccada} = w$

and $x^R = \text{cab}$ (the reverse of x)

Languages - a language is a set of strings

Let $L_1 = \{a, b, bc, ac, dd\}$

$$L_2 = \{\epsilon, ab, abab, ababab, \dots\}$$

$$L_3 = \{\} = \emptyset = \text{the empty language}$$

- we can describe a language using
 - plain English
 - set notation
 - enumeration
 - grammars
 - regular expressions
 - etc.