MTH231 Lecture 21

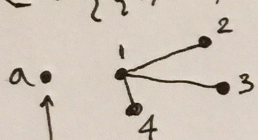
Graph Taxonomy

- A graph is an ordered pair of sets $G = (V, E)$, where $V \neq 0$ is called the vertex set, and E is a set of ordered or unordered pairs of elements from V, called an edge set. Can be multiset. The elements of V are called verticies or nodes

Ex: $G = (V, E)$

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

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



Pendent?

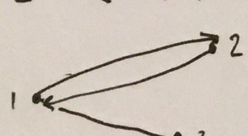
Isolated

Ex: if $E = \{ \{a, v\} \mid v \in V, v \neq a\}$

- Simple Directed Graph is a graph whose edge set, E, is a subset of $V \times V$ and $(v,v) \notin E$ for any $v \in V$.

Ex: $V = \{1, 2, 3\}$

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



Graph Type Chart

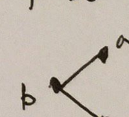
Graph	Edges	mult edg allow	loops allow
Simple ~~Undirected~~	Undirected	N	N
Multi-graph	undirected	Y	N
Pseudo~~code~~ graph	Undirected	YES	YES
Simple Directed	Directed	N (Y n diff dir)	N
multigraph —Directed	Directed	Y	Y
Mixed Graph	*	*	*

Undirected Graphs

- Two verticies, u, v, are called connected if $\{u, v\} \in E$ (i.e. E connects u, v). this makes them neighbors. E is called incident with u, v

- The Neighborhood of v in G is the set $N(v) := \{u \in V \mid \{v,u\} \in E\}$
  ↳ all the other verticies connected to one vertex form that vertex's neighborhood

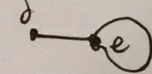
Ex:



$N(b) = \{a, c\}$

$N(\{a, c\}) = \{b\}$

Ex

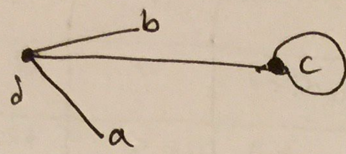


$N(e) = \{e, d\}$

- Neigborhood of a set

$$N(A) = \bigcup_{v \in A} N(v)$$

- Degree of a vertex = the number of edges leading <u>into</u> the node. this is denoted deg (vertex).



deg (a) = 1
deg (d) = 3
deg (c) = 3