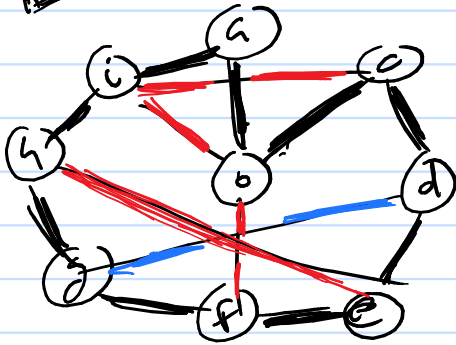


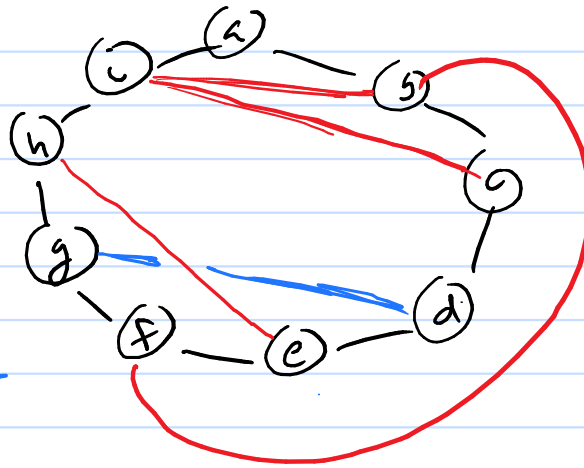
# Math 530

Q's

1.4 (3F)

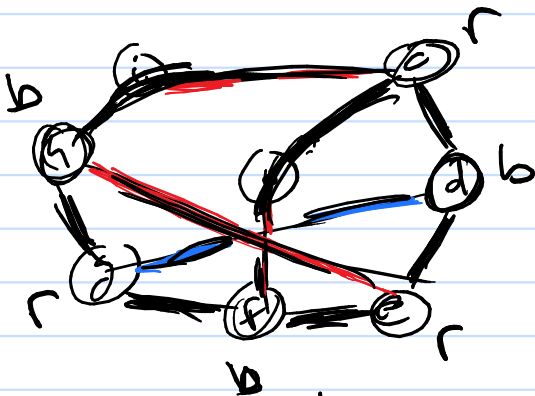


non-planar



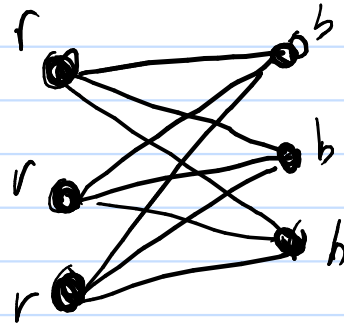
~~K\_{3,3}~~

$K_{3,3}$



$K_{3,3}$

$K_{3,3}$

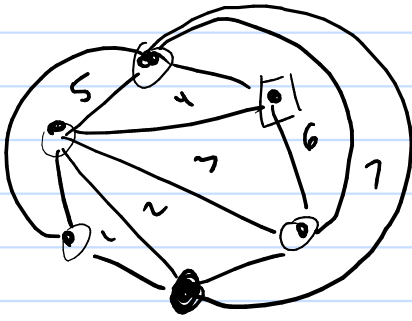


	planar	#2
7c	$ E  =  V  -  V  + 2$	$ E  \leq 3 V  - 6$
V  = 6	E  = 14	if planar

#2 is upper bound  $14 \leq 3(6) - 6$

$14 \leq 12$

not planar



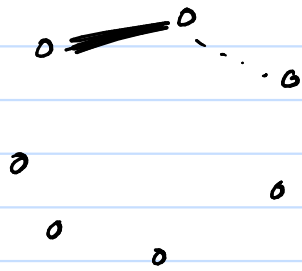
12 upper list

No more!

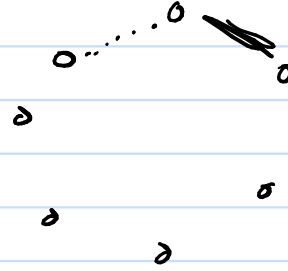
6

2.1 #3

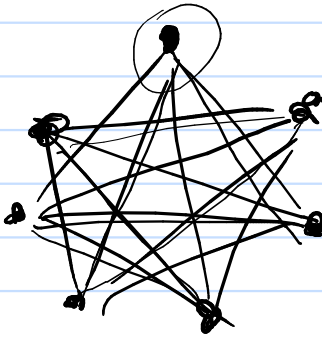
$|V| = 7$



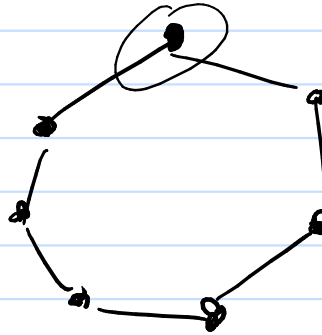
$G$



$\overline{G} = K_7 - G$



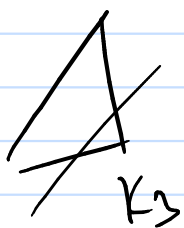
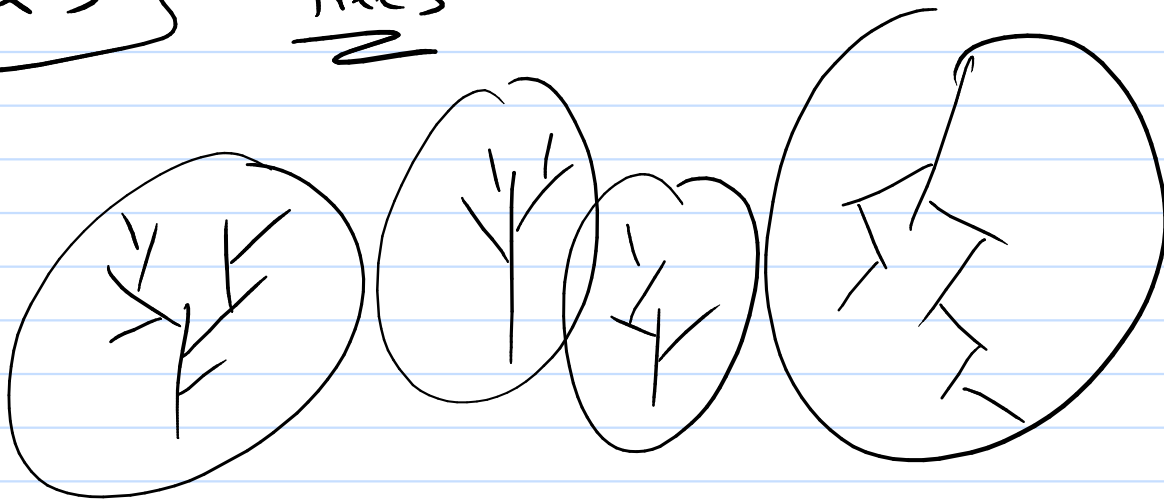
$G$



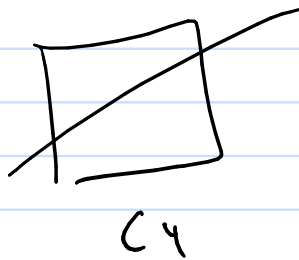
$\overline{G}$

Ch 3

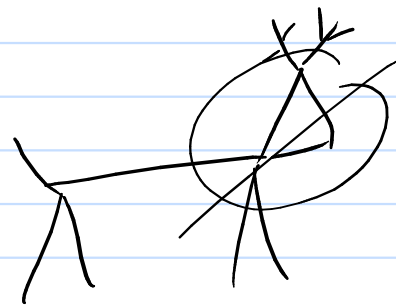
trees



$K_3$



$C_4$



**Def** An undirected simple graph is a tree  
if it is connected and it has no  
simple circuits.

**Th<sup>m</sup>**

$G$  is a tree

$G = (V, E)$

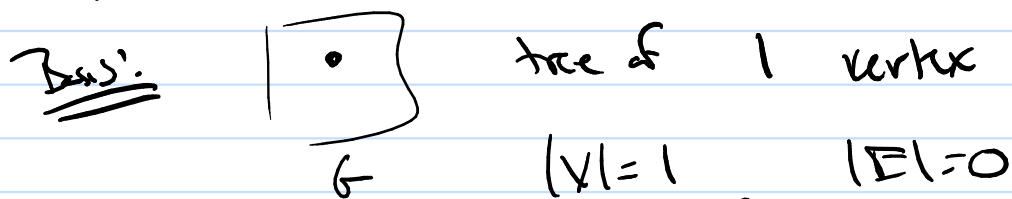
→ (iff) there is a unique simple path between any  
two distinct vertices.

→ (iff) a new graph  $(V, E - \{e\})$  is disconnected

→ (iff) a new graph  $(V, E + \{e\})$  has a simple circuit

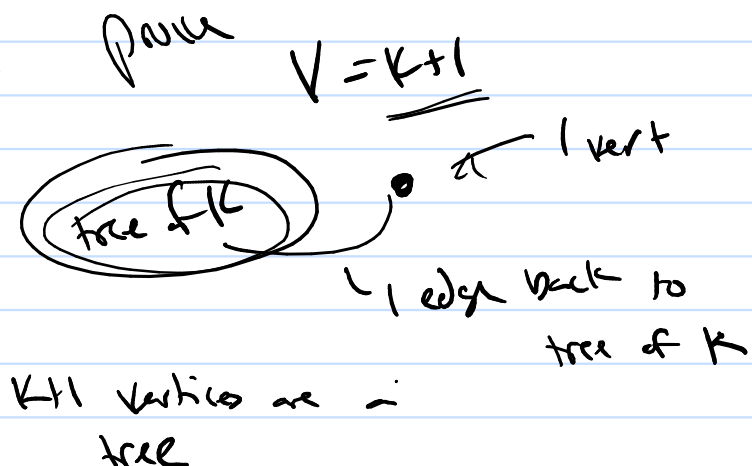
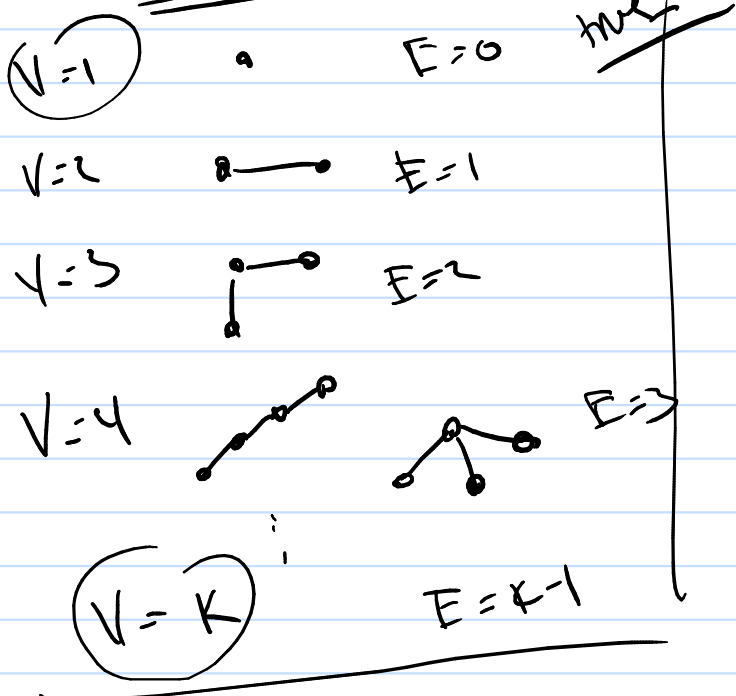
(iff)  $|E| = |V| - 1$

(ex) (pf) of  $|E| = |V| - 1$



$|E| = |V| - 1$  (0)

Inductive:



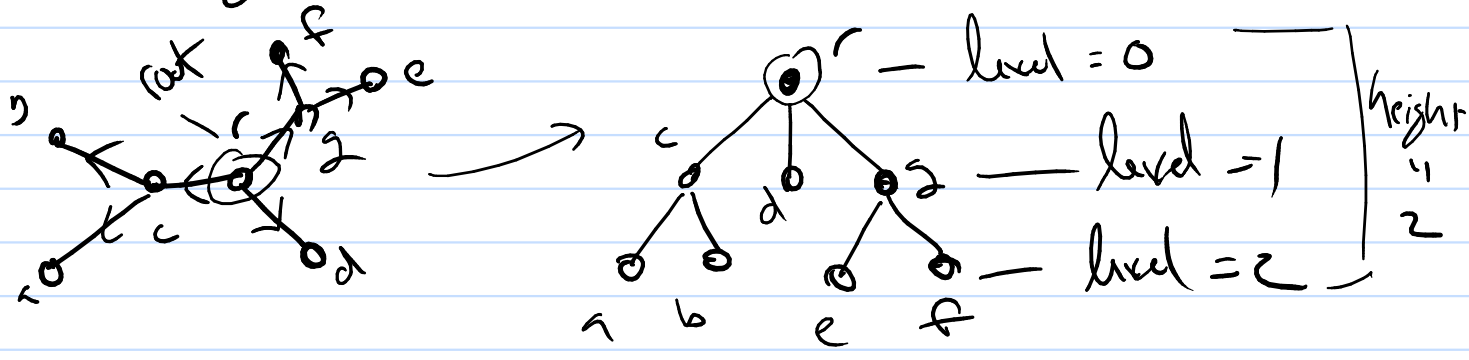
ind  $E = (K-1) + 1 = K$

↑ ↑

tree of K new edge

Rooted Tree  $\equiv$  is a tree with one vertex

designated as "root" and all edges are given direction away from the root.

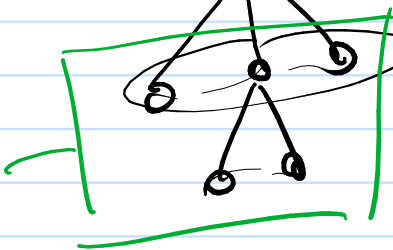


terms

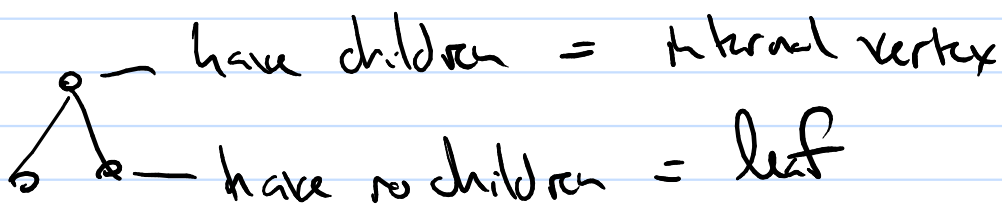
ancestors  $\leftarrow x$



descendants  
 $\leftarrow v$



all  $v$ 's children  
siblings to  
each other



If in a tree an internal vertex has at  
most  $m$  - children  $\rightarrow$  an  $m$ -ary tree  
- exactly  $m$  children  $\rightarrow$  full  $m$ -ary tree