

# Math 17 Graded HW2 Solutions

\* = multiple possible answers

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a) 6 vertices, 9 edges

b)  $\{1 \rightarrow 3, 1 \rightarrow 5, 1 \rightarrow 6, 2 \rightarrow 3, 2 \rightarrow 5, 3 \rightarrow 6, 4 \rightarrow 5, 4 \rightarrow 6, 5 \rightarrow 6\}$

c) 2, 3, 1, 6, 5, 4 is a path of length 5  
(you can also call this  $2 \rightarrow 3, 3 \rightarrow 1, 1 \rightarrow 6, 6 \rightarrow 5, 5 \rightarrow 4$ )

\* d) 1, 3, 6 is a circuit. This graph is not a tree.

e)

Vertex	deg
1	3
2	2
3	3
4	2
5	4
6	4

exactly 2 odd vertices  
 $\Rightarrow$  Euler Path (but no Ec)

\*  $\{1, 6, 4, 5, 6, 3, 2, 5, 1, 3\}$  is an Euler Path.

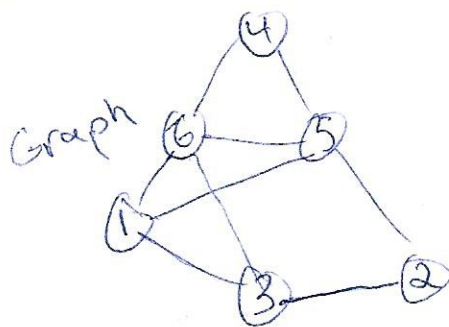
f)

From	To	Shortest Path length
1	2	2
1	3	1
1	4	2
1	5	1
1	6	1
2	3	1
2	4	2
2	5	1
2	6	2

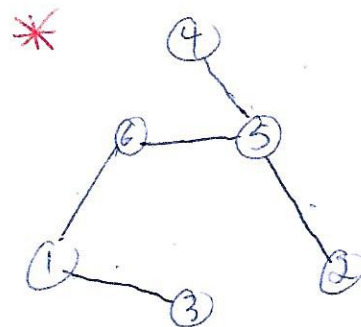
From	To	Shortest Path length
3	4	2
3	5	2
3	6	1
4	5	1
4	6	1
5	6	1

Diameter is the largest of these #'s which is 2.

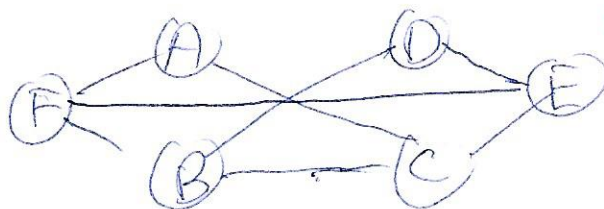
g)  $R = 9 - (6 - 1) = 9 - 5 = \underline{4}$



Spanning tree  
 $\hookrightarrow$



2 || a)



\* your layout might look different

b)

vertex	deg
A	2
B	3
C	3
D	2
E	3
F	3

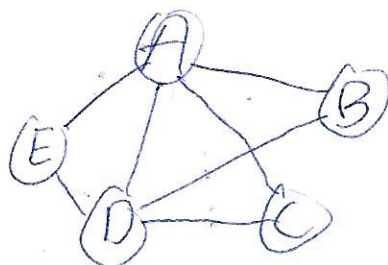
No EP/EC since there are more than 2 odd vertices.

c) A to D shortest path length is 3 (you can verify this is the longest by listing out all possibilities like 1f).

Diameter = 3

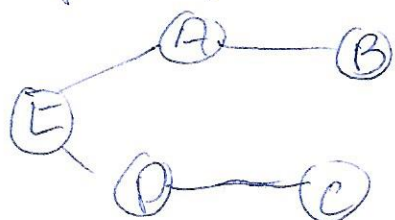
d) No cliques

3 || a)



\* your layout might look different

b) Spanning Tree



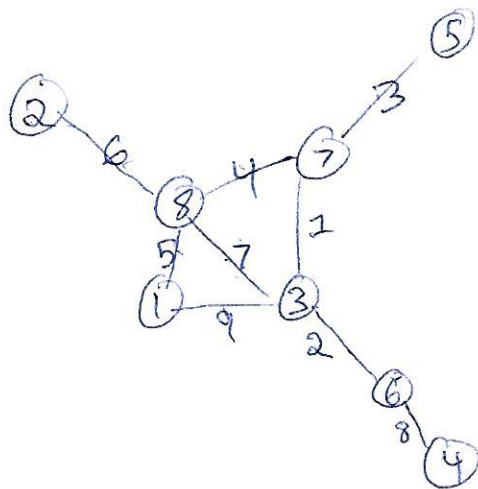
c)

$$\begin{bmatrix} 0 & 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 1 \\ 1 & 0 & 0 & 1 & 0 \end{bmatrix}$$

\*

Note:  $R = 7 - (5 - 1) = 3$   
and this matrix is the same as the one for the graph, but with  $2 \times 3 = 6$  of the 1s changed to 0s (corresponding to edges being deleted)

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a)  $R = 9 - (8 - 1) = 9 - 7 = 2$

b) Add edges 3:7, 3:6, 5:7, 7:8, 1:8, 2:8,

