CS/MATH 335: PROBABILITY, COMPUTING, AND GRAPH THEORY
HOMEWORK 1
DUE IN CLASS FRIDAY, SEPTEMBER 23, 2016

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Partner Problems

Roughly in order of difficulty

(1) Show that the components of a graph partition its vertex set.

(2) Mitzenmacher 4.18

(3) Mitzenmacher 4.23

(4) Mitzenmacher 4.10

Individual Problems

(5) □

	Edges	Max Deg	Min Degree	Av. Deg
N_n	0	0	0	0
$P_n(n > 2)$	n-1	2	1	$\frac{2(n-1)}{n}$
$C_n(n > 2)$	n	2	2	2
$K_n(n > 2)$	$\frac{n(n-1)}{2}$	$n-1$	$n-1$	$n-1$
$K_{n,n}(n > 1)$	n^2	n	n	n

In regards to P_n, C_n and K_n, if n= 2 then there is only 1 edge and the max, min and average degree is 1. If n = 1 or 0, then there are no edges and the max, min and average degree is 0. For $K_{n,n}$, if n=1 then there is only 1 edge and the max, min and average degree is 1. If n=0 then there are 0 edges and the max, min and average degree is 0.

(Assuming all graphs have the same number of nodes) A subgraph is made by simply removing edges from the initial graph, thus it is clear to see that N_n is a subgraph of all the other graphs since removing all edges from any graph will get you N_n

P_n is a subgraph of $C_n, K_n, K_{n,n}$. Removing any edge from C_n gets you P_n. Since K_n has every edge possible we can obtain P_n by removing the edges to create a path on n nodes. You can also obtain P_n from $K_{n,n}$ by removing the proper edges.

C_n is a subgraph of K_n and $K_{n,n}$. Since K_n has every edge possible we can obtain C_n by removing the edges to create a cycle on n nodes. We can also obtain C_n from $K_{n,n}$ by removing the proper edges.

$K_{n,n}$ is a subgraph of K_n. Since K_n is maximally connected we can obtain $K_{n,n}$ by removing the proper edges.

Lastly, K_n is only a subgraph of itself since it is maximally connected.

For any of the above graphs, excluding N_n, if $n = 2$ then its compliment is N_n. This is because there will only be one edge connecting 2 nodes, so the compliment of that graph is N_2.

The compliment of N_n is K_n (and vice versa) because N_n has no edges while K_n is maximally connected.

C_3's compliment is N_3