Department of Mathematics
Carnegie Mellon University
21-484 Applied Graph Theory
Test 1

Name:____________________________

Problem	Points	Score
1	34	
2	33	
3	33	
Total	100	

Q1 (34 points)
A bipartite graph $G = (X \cup Y, E)$ has at least $n^2 - n + 1$ edges where $n = |X| = |Y|$. Prove that G is connected.

Q2 (33 points)
G is a planar graph which has v vertices and no cycles of length less than k. Show that G has at most $\frac{k(v-2)}{k-2}$ edges.

Q3 (33 points)
$G = (V, E)$ is a connected graph. P_1, P_2 are both paths of maximum length in G. Prove that P_1 and P_2 have at least one common vertex.