Basic Network Analysis

1) The number of nodes in the random network is: 60
The number of nodes in the acquaintances network is: 40

2) The maximum in-degree in random network is: 9
The corresponding node id is: [3]
The maximum in-degree in acquaintances network is: 8
The corresponding node id is: [3]

Networks vs. Models (12 pts)

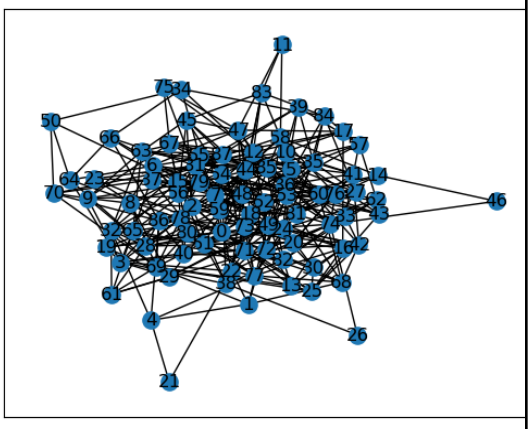
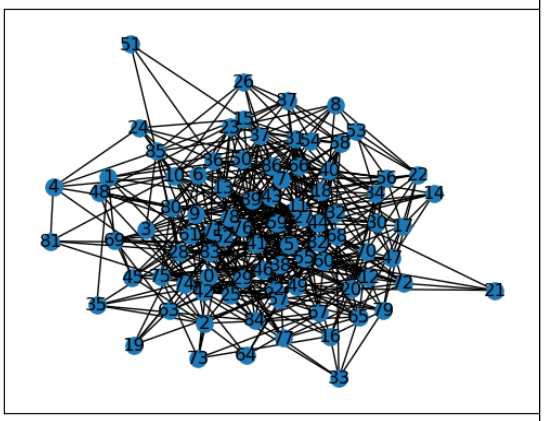
1) For each of the two empirical networks **seen as an undirected graph**, fill the information of the table below with their properties
Average Clustering Coefficient (<C>), average degree (<K>), average shortest path <l>, number of nodes and number of links

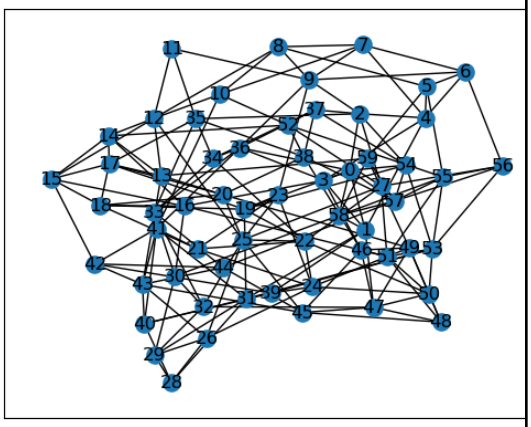
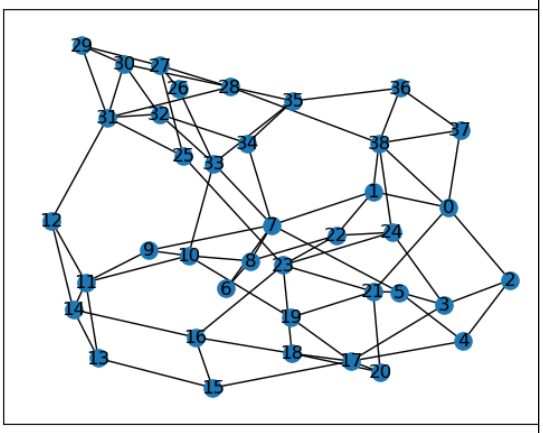
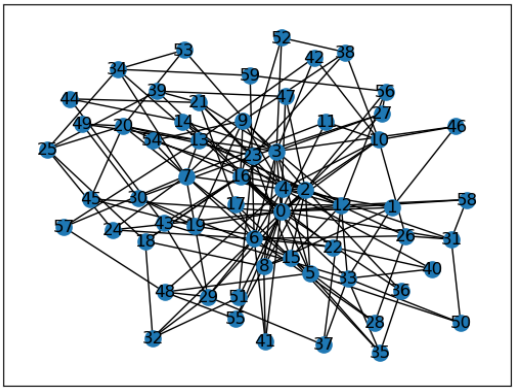
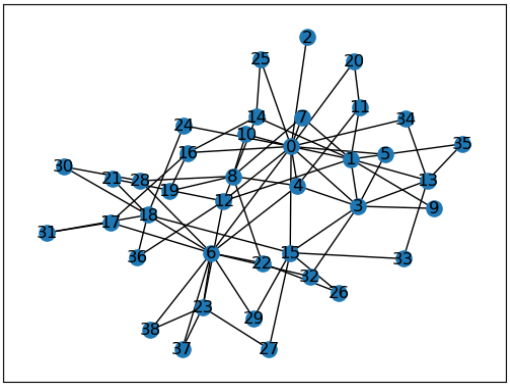
Network	<C>	<K>	<l>	#nodes	#Links
ClassNetwork_Random	0.1021218596218596	5.8	2.5	60	174
Random Graph Model (p=0.0983050847457627,N=60)	0.09017119244391969	5.8	2.267502612330198 5	88	390
Small World Model (p,k,n) (p=0.4110891305638993, N=60, k=6)	0.20269841269841274	6.0	2.5418079096045196	60	180
Barabasi Albert Model (N=60,Kmin=3)	0.15182324211735973	5.8	2.380225988700565	60	170

Network	<C>	<K>	<l>	#nodes	#Links
ClassNetwork_Acquaintances	0.12065527065527067	4.717948717948718	2.572199730094467	39	92
Random Graph Model (p=0.4141339267890697,N=60,k=6)	0.12888873418619398	4.717948717948718	2.098746081504 7023	88	473

Small World Model (p,k,n) (p=0.12415654520917 68, N=39, k=5)	0.2043956043 9560442	4.0	2.681511 47098515 53	39	78
Barabasi Albert Model (N=39,m=2)	0.1746383246 3832465	4.7179 48717 94871 8	2.53576248 31309042	39	74

2) Generate a Random Graph
3) Cp = C0 * (1-p)**3
4) Generate a small world graph
5) Generate a Barabasi Albert graph
6) plot histogram
7) The small world model resembles the empirical network more because their average shortest paths, number of nodes, and number of links are close. The plots for the degree also show similarities between the SW model and the empirical network. However, when comparing the clustering coefficient and average degree, the random graph model does a better job.
8) I think the empirical networks have the Small World network property because their average shortest path lengths are similar. This is often due to the presence of hubs that serve as shortcuts in the network.

	Random	Acquaintance
2) Random		

4) Small World		
5) Barabasi Albert		
6) Plot