Assignment 3: Solutions

TOTAL MARKS: 0

1. Solutions:

student no.	assortativity	triangles	triples	clustering	mean local clustering
a1709218	0.106	462	14265	0.0972	0.1007
a1734046	0.087	423	13607	0.0933	0.0898
a1813487	0.071	477	14253	0.1004	0.1038
a1820798	0.163	419	13114	0.0959	0.1020
a1825938	0.083	428	13535	0.0949	0.1017
a1871781	0.122	490	14414	0.1020	0.1016
a1871789	0.086	399	13456	0.0890	0.0948
a1897413	0.094	499	14305	0.1046	0.1073
a1898629	0.011	346	11201	0.0927	0.0972
a1907611	0.065	262	9564	0.0822	0.0858
a1932791	0.095	437	13699	0.0957	0.0978

2. Solutions:

student no.	PageRank										
a1709218	0.00737	0.00373	0.00440	0.00550	0.00643	0.00616	0.00471	0.00836	0.00402	0.00290	0
a1734046	0.00232	0.00368	0.00404	0.00445	0.00255	0.00402	0.00589	0.00627	0.00472	0.00443	0
a1813487	0.00675	0.00267	0.00393	0.00439	0.00417	0.00219	0.00353	0.00753	0.00591	0.00602	0
a1820798	0.00348	0.00438	0.00236	0.00274	0.00492	0.00359	0.00666	0.00565	0.00226	0.00710	0
a1825938	0.00332	0.00640	0.00664	0.00451	0.00558	0.00259	0.00523	0.00548	0.00517	0.00495	0
a1871781	0.00616	0.00709	0.00421	0.00671	0.00438	0.00409	0.00755	0.00344	0.00716	0.00696	0
a1871789	0.00561	0.00615	0.00540	0.00654	0.00644	0.00558	0.00690	0.00648	0.00792	0.00565	0
a1897413	0.00632	0.00786	0.00485	0.00339	0.00534	0.00458	0.00594	0.00690	0.00701	0.00638	0
a1898629	0.00491	0.00289	0.00285	0.00473	0.00525	0.00612	0.00399	0.00551	0.00203	0.00677	0
a1907611	0.00654	0.00379	0.00544	0.00517	0.00171	0.00614	0.00442	0.00584	0.00694	0.00603	0
a1932791	0.00853	0.00480	0.00189	0.00256	0.00294	0.00378	0.00228	0.00472	0.00505	0.00571	0

   Code to solve the problem is included below. Please note that this is written to be obvious, not efficient.

3. This variant of Nim is sometimes called Wythoff's game, and there is a fair bit written about it.

   See the separate document on Wythoff's Nim in the handouts section for a detailed explanation of the winning strategy.

   The hard bit is that I want you to see that there is a deeper structure to the general strategy: it's relationship to Fibonacci numbers and the Golden string.

```
function [C, connected_triples, triangles] = clustering2(A)
%
% file:       clustering2.m, (c) Matthew Roughan, Wed Mar 17 2010
% created:  Wed Mar 17 2010
% author:   Matthew Roughan
% email:    matthew.roughan@adelaide.edu.au
%
% Compute the global clustering coefficients on an undirected graph
%
% Inputs:
%     A = nxn adjaceny matrix
%           -- 0,1 matrix, where a 1 indicates a link
%           -- diagonal elements should be zero
%           -- assume undirected graph, so A is symmetric
%
% Outputs:
%    C = global clustering coefficients
%

% calculate the number of connected triples
%   its just the number of two-hop paths
%         remove diagonals, because they are just paths from node to itself
%         divide by two because direction means a triple is counted twice
D = A^2;
D = D - diag(diag(D));
connected_triples = sum(sum(D))/2;

% calculate the number of triangles
%   count number of paths of length 3 from a node to itself (the diagonals of A^3)
%   divide by 6 because each will be counted three times, in each of 2 directions
triangles = sum(diag(A^3))/6;

% the clustering is just the number of triangles times 3,
% divided by number of connected triples
if connected_triples>=1
  C = 3*triangles / connected_triples;
else
  C = 0.0; % just to make it behave
end
```