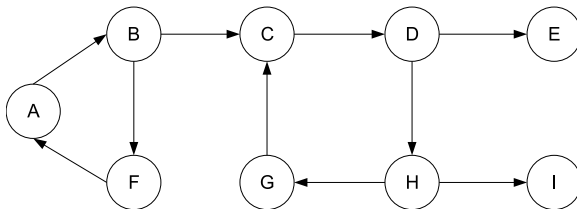# CS485 Spring 2007
Homework 10

Due Date: April 6 2007

NOTE: To speed up homework grading, please submit each homework problem on a separate sheet of paper, with you name and NetID on the top. Thank you!

1. Consider a graph used in class:

   (add restart vertex to it, with restart probability 0.15)

   (a) Calculate PageRank for all vertices of the graph.

   (b) Calculate the Discovery time for all vertices. (e.g. by simulation of a random walk)

   (c) Assume you own pages A, B, C. Increase the cumulative PageRank of these three pages as much as you can by redirecting/adding/removing any links going from these pages. How is the discovery time affected by your change?

2. Consider a web page with a single in-link and a single out-link (plus restart). What is the maximum increase in PageRank of that web page that can be achieved by only adding loops of length 2 (links to pages that only link to this one)?

3. Grow an oriented graph with preferential attachment with 100 vertices and $\delta = 2$ (both edges are directed away from the newly added vertex). Now generate a random graph with the same number of vertices and (approximately) edges (randomly orientated).

   (a) Compute PageRank for all vertices in both graphs. Plot histograms of the rank values.

   (b) Plot the rank values against vertex in and out degrees. Comment on whether you see a correlation.