| CS 395T | Large-Scale Data Mining | Fall 2001 |
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# Homework 1

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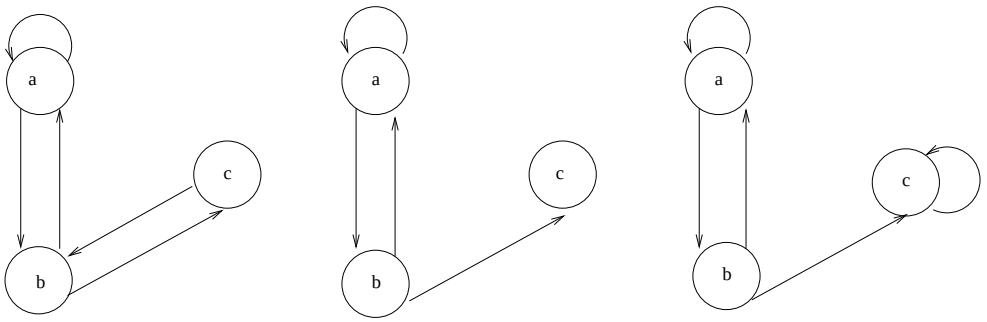
**Due:** Sept. 25, 2001

**Keywords:** *Hubs&Authorities, PageRank*

1. In the basic PageRank iteration, $\mathbf{r}^{(k+1)} = \mathbf{A}^T\mathbf{r}^{(k)}$.
   If $||\mathbf{r}^{(k)}||_1 = 1$, is $||\mathbf{r}^{(k+1)}||_1 = 1$ ? Give reasons.

2. Consider the 3 possible web graphs :




( i ) ( ii ) ( iii )

   What are the PageRanks in each of the above web graphs under the following conditions:

   A. without an extra rank source,

   B. with an extra rank source $\mathbf{s}$ (take each $s_i$ to be 0.1).

3. Using Kleinberg's basic algorithm, calculate hub and authority weight vectors for each of the web graphs above. In all cases, show $\mathbf{A}\mathbf{A}^T$, $\mathbf{A}^T\mathbf{A}$ and the leading left and right singular vectors.