

1 Example Midterm 2

As previously this is just an example and the actual midterm will be slightly different. I will probably provide a specific example in Problem 3. Problem 2 is going to be different but it will be taken from the exercises from Ch. 7.

Problem 1.1. Let A be a transition matrix:

$$A = \begin{bmatrix} \frac{1}{2} & \frac{1}{3} & 0 \\ \frac{1}{2} & \frac{1}{3} & \frac{1}{4} \\ 0 & \frac{1}{3} & \frac{3}{4} \end{bmatrix}.$$

- (A) Draw the diagram for the transition matrix A .
- (B) Does A have a steady state? Find it.
- (C) Does the initial state

$$x_0 = \begin{bmatrix} \frac{1}{401} \\ \frac{399}{401} \\ \frac{1}{401} \end{bmatrix}$$

converge to the steady state (that is $\lim_{k \rightarrow \infty} T^k x_0 = \text{steady state}$)?

Problem 1.2. Write down an example of a 3×3 symmetric and regular transition matrix and draw the corresponding population movement diagram.

Problem 1.3. Provide an example of an internet with 3 pages and at least one link. Find the Google Pagerank for your example.

Problem 1.4. Consider the data matrix

$$A = \begin{bmatrix} 2 & 1 & 0 \\ 1 & 1 & 4 \end{bmatrix}.$$

- (A) Center the data.
- (B) Find the SVD for the centered A .
- (C) Compute A' , obtained by replacing the smallest singular value in Σ by 0.
- (D) What percentage of the total variance of A is preserved by A' ?