1. Given a $n \times n$ matrix A, how to find the eigenvalues and eigenvectors?

2. Definition of Markov matrix and make an example.

3. Solve differential equation system
$$\frac{du}{dt} = Au$$
   for $u(t)$ being a n dimensional vector fuction.

Problems

1. If A has two eigenvalues being λ_1 and λ_2 and their eigenvalues being u_1 and u_2 respectively.

   (a) Then what is $A(xu_1 + yu_2)$ where x, y are numbers?

   (b) What is $e^A(xu_1 + yu_2)$?

2. Find the eigenvalues and eigenvectors for the following matrices.

(a) $\begin{pmatrix} 0.8 & 0.4 \\ 0.2 & 0.6 \end{pmatrix}$

(b) $\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$

3. What can you say about $\lim_{n \to \infty} A^n$ for A of the two cases above?