Exercises for Lecture 7

Exercise 1: Some Questions

Q1. Derive the transition kernel K for the discrete MH example in the lecture notes. How does the K change if $\pi_1 > \pi_2$?

Q2. Derive the eigenvalues of K.

Q3. Show that $\pi' K = \pi'$, where $\pi' = [\pi_1, \pi_2]$. Interpret this equation.

Exercise 2: Metropolis Hastings Sampler

(i) The Matlab program *Metropolis.m* uses the RWMH algorithm to generate draws from a bimodal distribution. Read through the program code and run it with the default settings.

(ii) To explore the performance of the Metropolis Algorithm, vary the parameters of the "posterior" distribution, μ_1, μ_2, Σ, and p. What happens to the accuracy of the numerical approximation?

(iii) To explore the performance of the Metropolis Algorithm, vary the number of draws, the fraction of initial draws being discarded, and the variance-covariance matrix of the proposal density. What happens to the accuracy of the numerical approximation?