EE 511 - Spring 2019
Project 4

1. **DTFS MC Stationary distributions**: Find stationary distributions for a discrete time finite state (DTFS) Markov chain $\{X_n\}$ having transition matrix:

$$\mathbb{P} = \begin{bmatrix} 1 - a & a \\ b & 1 - b \end{bmatrix}$$

when (i) a=1/10 and b=1/15, (ii) a=0.5 and b=0.5, (iii) a=1 and b=1, (iv) a=0 and b=0

2. **DTFS MC Simulation**: Simulate 10 sample paths of length 500 for the DTFS Markov chains below using the update equation

$$\vec{\pi}(t + 1) = \vec{\pi}(t).\mathbb{P} \tag{1}$$

All MCs start with the initial probability vector $\vec{\pi}(t = 0) = (1, 0)$.

$$\mathbb{P}_1 = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$$

$$\mathbb{P}_2 = \begin{bmatrix} 0.75 & 0.25 \\ 0.1 & 0.9 \end{bmatrix}$$

$$\mathbb{P}_3 = \begin{bmatrix} 0.48 & 0.48 & 0.04 \\ 0.22 & 0.7 & 0.08 \\ 0 & 0 & 1 \end{bmatrix}$$

Check for MC convergence by applying a goodness-of-fit test to the last 75 samples of each sample path. Compare the ensemble and time averages for the 3 Markov chains. Based on these averages, which of the chains are ergodic?