

MATH 4F83

Assignment #1

1. a. Find the fixed probability vector of

$$\begin{bmatrix} 0 & .4 & 0 & .6 \\ .2 & 0 & .8 & 0 \\ 0 & .5 & 0 & .5 \\ .7 & 0 & .3 & 0 \end{bmatrix}$$

- b. Starting in State 1, what is the probability of being in State 4 after 1001 transitions?

2. Find

$$\begin{bmatrix} .5 & .5 & 0 & 0 & 0 & 0 \\ .2 & .8 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & .4 & .6 & 0 & 0 \\ .1 & 0 & 0 & .2 & .3 & .4 \end{bmatrix}^{10000}$$

3. Do a complete classification of

$$\begin{bmatrix} x & 0 & 0 & 0 & 0 & 0 & 0 & x \\ 0 & 0 & 0 & 0 & 0 & x & 0 & 0 \\ 0 & 0 & 0 & 0 & x & 0 & 0 & x \\ 0 & 0 & 0 & 0 & 0 & 0 & x & 0 \\ 0 & 0 & x & 0 & x & 0 & 0 & 0 \\ 0 & x & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & x & 0 & 0 & x & 0 \\ x & 0 & 0 & 0 & 0 & x & 0 & 0 \end{bmatrix}$$

4. And one more

$$\begin{bmatrix} x & 0 & 0 & 0 & x & 0 & x & 0 & 0 & 0 \\ 0 & x & 0 & 0 & 0 & 0 & 0 & 0 & 0 & x \\ 0 & 0 & 0 & 0 & x & 0 & 0 & x & 0 & 0 \\ 0 & 0 & 0 & x & 0 & 0 & 0 & 0 & x & 0 \\ x & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & x & 0 & x & 0 & 0 \\ x & 0 & 0 & 0 & 0 & 0 & x & 0 & 0 & 0 \\ 0 & 0 & x & 0 & 0 & x & 0 & x & 0 & 0 \\ 0 & x & 0 & x & 0 & 0 & 0 & x & 0 & 0 \\ 0 & x & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

5. And yet another one

$$\begin{bmatrix} x & 0 & x & 0 & 0 & x & x & 0 & 0 \\ 0 & 0 & 0 & 0 & x & 0 & 0 & 0 & 0 \\ 0 & 0 & x & 0 & 0 & 0 & x & 0 & 0 \\ x & x & 0 & x & x & x & 0 & x & x \\ 0 & x & 0 & 0 & 0 & 0 & 0 & 0 & x \\ x & 0 & x & 0 & 0 & x & x & 0 & 0 \\ 0 & 0 & x & 0 & 0 & 0 & x & 0 & 0 \\ x & x & 0 & x & x & x & 0 & x & x \\ 0 & 0 & 0 & 0 & x & 0 & 0 & 0 & 0 \end{bmatrix}$$

6. If X_0 is generated from

$X_0 =$	1	2	3
Prob:	0.6	0.3	0.1

and

$$\mathbb{P} = \begin{bmatrix} 0.3 & 0.2 & 0.5 \\ 0 & 0.4 & 0.6 \\ 0.3 & 0.3 & 0.4 \end{bmatrix}$$

Find the probability of $X_2 = 1 \cap X_4 = 3$.

7. Find

$$\begin{bmatrix} 0 & 0.5 & 0 & 0.2 & 0 & 0 & 0.3 & 0 \\ 0 & 0 & 0.1 & 0 & 0.5 & 0.4 & 0 & 0 \\ 0.2 & 0 & 0 & 0 & 0 & 0 & 0 & 0.8 \\ 0 & 0 & 0.3 & 0 & 0.4 & 0.3 & 0 & 0 \\ 0.7 & 0 & 0 & 0 & 0 & 0 & 0 & 0.3 \\ 0.5 & 0 & 0 & 0 & 0 & 0 & 0 & 0.5 \\ 0 & 0 & 0.2 & 0 & 0.6 & 0.2 & 0 & 0 \\ 0 & 0.7 & 0 & 0.1 & 0 & 0 & 0.2 & 0 \end{bmatrix}^{458}$$

8. And

$$\begin{bmatrix} 0 & 0 & 0.3 & 0.7 & 0 & 0 & 0 \\ 0 & 0 & 0.2 & 0.8 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0.4 & 0.6 & 0 \\ 0 & 0 & 0 & 0 & 0.5 & 0.5 & 0 \\ 0.6 & 0.4 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0.1 & 0.1 & 0.1 & 0.1 & 0.1 & 0.1 & 0.4 \end{bmatrix}^{326}$$

9. For

$$\mathbb{P} = \begin{bmatrix} 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0.2 & 0.8 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0.3 & 0.7 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0.4 & 0 & 0 & 0.6 \\ 0 & 0.5 & 0 & 0 & 0 & 0.5 & 0 \end{bmatrix}$$

find: $\Pr(X_{1000} = 1 | X_0 = 7)$, $\Pr(X_{1000} = 4 | X_0 = 5)$ and $\Pr(X_{1000} = 4 | X_0 = 6)$.