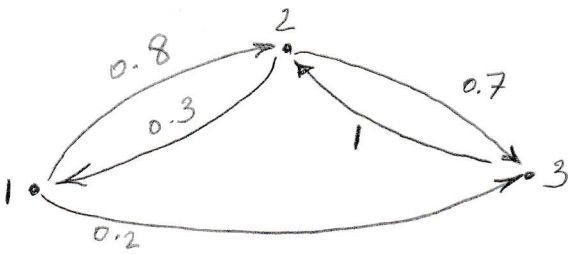
MATH 118 **Chapter 9 Quiz** Key **Name:** **ID No:**

1. For $T = \begin{bmatrix} 0 & 0.8 & 0.2 \\ 0.3 & 0 & 0.7 \\ 0 & 1 & 0 \end{bmatrix}$

Draw the transition diagram



a) Irreducible? (Yes) or No

find T^2

$$T^2 = T \cdot T = \begin{bmatrix} 0.24 & 0.2 & 0.56 \\ 0 & 0.94 & 0.06 \\ 0.3 & 0 & 0.7 \end{bmatrix}$$

b) Regular? (Yes) or No

2. Using the following initial state: $P_0 = [0.2 \quad 0.3 \quad 0.5]$, find the state vector after **two** transition for:

$$T = \begin{bmatrix} 0 & 0.3 & 0.7 \\ 0.2 & 0.8 & 0 \\ 0.5 & 0 & 0.5 \end{bmatrix}$$

$$P_2 = P_0 \cdot T^2$$

$$T^2 = T \cdot T = \begin{bmatrix} 0 & 0.3 & 0.7 \\ 0.2 & 0.8 & 0 \\ 0.5 & 0 & 0.5 \end{bmatrix} \begin{bmatrix} 0 & 0.3 & 0.7 \\ 0.2 & 0.8 & 0 \\ 0.5 & 0 & 0.5 \end{bmatrix}$$

$$= \begin{bmatrix} 0.41 & 0.24 & 0.35 \\ 0.16 & 0.7 & 0.14 \\ 0.25 & 0.15 & 0.6 \end{bmatrix}$$

$$P^2 = P_0 \cdot T^2 = [0.255 \quad 0.333 \quad 0.412]$$

3. In Indianapolis, it was found that if it is raining today, then there is 80% chance of it raining again the next day. If it is dry today, then there is 60% chance of it being dry again the next day. Find the steady state vector.

$$T = \begin{matrix} R \\ D \end{matrix} \begin{bmatrix} 0.8 & 0.2 \\ 0.4 & 0.6 \end{bmatrix}; \quad [x \quad y] \begin{bmatrix} 0.8 & 0.2 \\ 0.4 & 0.6 \end{bmatrix} = [x \quad y]$$

$0.8x + 0.4y = x$

$0.2x + 0.6y = y$

$\Downarrow$

$-0.2x + 0.4y = 0$

$0.2x - 0.4y = 0$

$x + y = 1$

Take 2 equations

$-0.2x + 0.4y = 0$

$x + y = 1$

or

$-2x + 4y = 0$

$x + y = 1$

Solve for x & y

$x = \frac{4}{6} = \frac{2}{3}$

$y = \frac{2}{6} = \frac{1}{3}$

The Sum = 1