

Q26

Stationary distribution

$$[x \ y \ z]$$

$$= [x \ y \ z] \begin{bmatrix} 0.2 & 0.7 & 0.1 \\ 0.2 & 0.5 & 0.3 \\ 0.2 & 0.1 & 0.4 \end{bmatrix} = \pi^\infty$$

$$x = 0.2x + 0.2y + 0.2z$$

$$y = 0.7x + 0.5y + 0.4z$$

$$z = 0.1x + 0.3y + 0.4z$$

$$x = 0.2x + 0.2y + 0.2z$$
$$-0.2x \quad -0.2x$$

$$\frac{.8x}{.8} = \frac{0.2y + 0.2z}{.8}$$

$$x = 0.25y + 0.25z$$

$$y = 0.7x + 0.5y + 0.4z$$
$$-0.5y \quad -0.5y$$

$$\frac{0.5y}{0.5} = \frac{0.7x}{0.5} + \frac{0.4z}{0.5}$$

$$y = 1.4x + 0.8z$$

$$y = 1.4(0.25y + 0.25z)$$

$$y = 0.35y + 0.35z + 0.8z$$
$$-0.35y \quad -0.35y$$

$$.65y = 0.35z + 0.8z$$

$$\frac{.65y}{.65} = \frac{1.15z}{.65}$$

$$y = \frac{1.15}{.65}z$$

$$\begin{aligned}x &= 0.2x + 0.2y + 0.2z \\y &= 0.7x + 0.5y + 0.4z \\z &= 0.1x + 0.3y + 0.9z\end{aligned}$$

$$x = 0.25y + 0.25z$$

$$y = \frac{1.15}{.65} z$$

$$z = 0.25\left(\frac{1.15z}{.65}\right) + 0.25z + 0.3\left(\frac{1.15z}{.65}\right) + 0.4z$$

$$x = \frac{1}{5}$$

$$y = \frac{23}{45}$$

$$z = \frac{13}{45}$$

plugged into
Wolfram Alpha

System of
eqn solver

Q_{3b}

$$E[T_i] = M_i = 1 + p_{11}M_1 + p_{12}M_2 + p_{13}M_3$$

$$M_2 = 1 + p_{21}M_1 + p_{22}M_2 + p_{23}M_3$$

$$~~M_3 = 1 + p_{31}M_1 + p_{32}M_2 + p_{33}M_3~~$$

$$P = \begin{bmatrix} 0.2 & 0.7 & 0.1 \\ 0.2 & 0.5 & 0.3 \\ 0 & 0 & 1 \end{bmatrix}$$

$$M_3 = 0$$

solved w/ system of eqn solver

$$\begin{cases} M_1 = \frac{35}{16} \text{ and } M_2 = \frac{25}{9} \\ M_3 = 0 \end{cases}$$