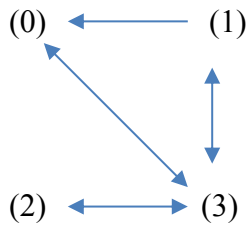


Each problem is worth 10 points. Show all work for full credit, and use correct notation. Simplify answers completely. See other side for additional problems.

Use the following schematic diagram for possible transitions between states for numbers 1 and 2.



1. Write an expression for the KDE ${}_t\dot{p}_x^{22}$

$${}_t\dot{p}_x^{22} = {}_t p_x^{23} \cdot \mu_{x+t}^{32} - {}_t p_x^{22} \cdot \mu_{x+t}^{23}$$

2. Write an expression for the KDE ${}_t\dot{p}_x^{00}$

$${}_t\dot{p}_x^{00} = {}_t p_x^{01} \cdot \mu_{x+t}^{10} + {}_t p_x^{03} \cdot \mu_{x+t}^{30} - {}_t p_x^{00} \cdot \mu_{x+t}^{03}$$

3. Write an expression for the KDE ${}_t\dot{p}_x^{13}$

$${}_t\dot{p}_x^{13} = {}_t p_x^{10} \cdot \mu_{x+t}^{03} + {}_t p_x^{11} \cdot \mu_{x+t}^{13} + {}_t p_x^{12} \cdot \mu_{x+t}^{23} - {}_t p_x^{13} \cdot (\mu_{x+t}^{30} + \mu_{x+t}^{31} + \mu_{x+t}^{32})$$

4. In a 3-state model, you are given:

$$\mu_t^{01} = 0.5 + 0.6t$$

$$\mu_t^{10} = 0.2$$

$$\mu_t^{12} = 2^t$$

Determine $p_0^{\overline{00}}$

$$p_0^{\overline{00}} = e^{-\int_0^1 \mu_t^{0\tau} dt} = e^{-\int_0^1 \mu_t^{01} dt} = e^{-\int_0^1 (0.5+0.6t) dt} = e^{-0.8}$$

5. You are given:

t	${}_t\dot{p}_x^{11}$
0	-1.20
0.5	-0.56

Use Euler's Forward Equation with step size 0.5 to approximate p_x^{11}

$$\text{EM: } y(t+h) = y(t) + h \cdot \dot{y}(t)$$

$$y(t) = {}_t p_x^{11}$$

The initial condition is ${}_0 p_x^{11} = 1$

With $t = 0$ and $h = 0.5$, the first step gives:

$${}_{0.5} p_x^{11} = {}_0 p_x^{11} + 0.5 \cdot {}_0 \dot{p}_x^{11} = 1 + 0.5(-1.20) = 0.4$$

With $t = 0.5$ and $h = 0.5$, the second step gives:

$$p_x^{11} = {}_{0.5} p_x^{11} + 0.5 \cdot {}_{0.5} \dot{p}_x^{11} = 0.4 + 0.5(-0.56) = 0.12$$