Kalman Filter:

$$\dot{x} = \begin{bmatrix} 1 & 0 \\ 2 & 3 \end{bmatrix} x + \begin{bmatrix} 1 \\ 2 \end{bmatrix} u + w \qquad w \sim N(0, W)$$
$$v \sim N(0, V)$$

$$y = \begin{bmatrix} 0 & 1 \end{bmatrix} x + v$$

Design a (steady-state) Kalman filter: (use duality between CARE & FARE to get your kalman filter gain matrix)

$$L = S C^T V^{-1} \quad \text{where } S \text{ solves the FARE}$$

From duality we could get this using lqr:

$$L = \text{lqr}(A', C', W, V) \qquad \text{w/ } W = \begin{bmatrix} 2 & 0 \\ 0 & 4 \end{bmatrix}$$
$$V = S$$

or

$$L = \text{lqe}(A, \text{eye}(2), C, W, V) \qquad \text{Then } L = \begin{bmatrix} 4.283 \\ 8.1896 \end{bmatrix}$$