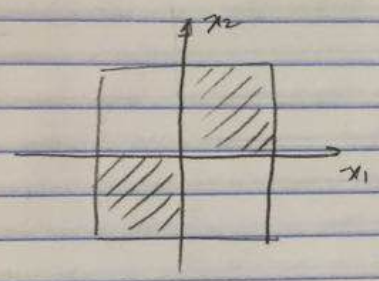
Problem #3

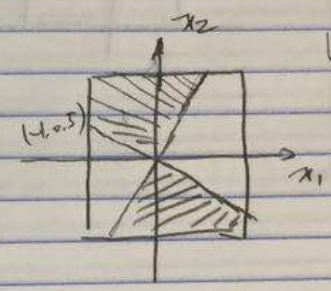
1b)

$$x_t = \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} \qquad x_{t+1} = \begin{cases} \begin{bmatrix} 0.5x_1 - x_2 \\ x_1 + 0.5x_2 \end{bmatrix} & u_1 \\ \begin{bmatrix} x_1 + 0.5x_2 \\ 0.5x_1 + 0.5x_2 \end{bmatrix} & u_2 \end{cases}$$

$t=0$



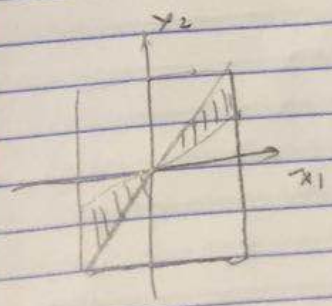
$t=1$ use u_1



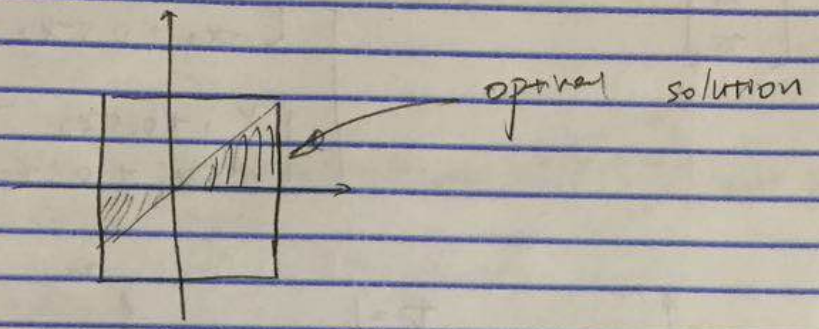
$$\begin{cases} x_1 = 0 & x_2 = 1 \\ & \Downarrow u_1 \\ x_1 = -1 & x_2 = 0.5 \end{cases}$$

$$\begin{cases} x_1 = 1 & x_2 = 0 \\ & \Downarrow u_1 \\ x_1 = 0.5 & x_2 = 1 \end{cases}$$

$t=1$ use u_2



$$\begin{cases} x_1 = 0 & x_2 = 1 \\ & \Downarrow u_2 \\ x_1 = 0.5 & x_2 = 0.5 \end{cases}$$

$$\begin{cases} x_1 = 1 & x_2 = 0 \\ & \Downarrow u_2 \\ x_1 = 1 & x_2 = 0.5 \end{cases}$$

For $t=3$