Due Tuesday, October 4

(1) Problem 2.27

(2) Problem 2.32

(3) Consider the system

\[ \dot{x}(t) = Ax(t) + Bu(t) \]
\[ y(t) = Cx(t) + Du(t) \]

with

\[ A = \begin{bmatrix} -1 & 0 & 0 \\ 0 & -2 & 0 \\ 0 & 0 & -3 \end{bmatrix}, \quad B = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}, \quad C = [6, -6, 1], \quad D = 0. \]

(a) Use the representation for \( e^{At} \) to compute the state response to a unit step. Plot the evolution of the three states in one figure. You can label them using the matlab command \texttt{gtext}.

(b) Now use the Matlab command \texttt{[y,x] = step(A,B,C,D)} to compute the step response and compare it to what you found in (a).

Note: You can find the impulse response using the command \texttt{impulse}.