EC401 HW10 Spring 2020

Due Date: Wednesday April 29, 2020

You must submit your homework in pdf form to the EC401 Blackboard Learn site by 12:30pm on the due date. Please be sure to write your name on the first page of the homework you submit. Additionally, if you have collaborated on the homework with other individuals enrolled in EC401 this semester, please identify them as your collaborators on the first page of the submitted homework.

HW10.1

For each impulse response of a continuous-time LTI system determine (1) whether or not the system is causal and (2) whether or not the system is stable. *Justify your answers*.

a) $h(t) = e^{-2t}u(t-1)$
b) $h(t) = e^{2t}u(-t+1)$
c) $h(t) = e^{4t}\cos(2t)\,u(t)$
d) $h(t) = cos(100\pi t)u(t+1)$

HW10.2

For each impulse response of a discrete-time LTI system determine (1) whether or not the system is causal and (2) whether or not the system is stable.

a) $h[n] = (0.9)^n u[n+2]$
b) $h[n] = (0.9)^{-n} u[-n+2]$
c) $h[n] = (-1)^n u[-n-2]$

HW10.3

Let $x(t)$ be a signal whose derivative is $g(t) = \frac{d}{dt}x(t)$. If $G(j\omega) = 2\sin(2\omega)$, determine and sketch $|X(j\omega)|$. *Show your work.*

HW10.4 (We recommend that you do this problem *after* the lecture on Monday April 27)

Consider a *causal* LTI system S whose input $x(t)$ and output $y(t)$ are related by the following linear constant differential equation:

$$\frac{d^2y(t)}{dt^2} + \frac{5dy(t)}{dt} + 6y(t) = 2x(t)$$

Using the *Laplace* transform, determine whether or not the system S is stable. *Justify your answer.*