

University of Portland School of Engineering

EE 262
Spring 2018
A. Inan

Homework # 2—LTI Systems

(Assigned: Monday, January 22, 2018)

(Due: Wednesday, January 31, 2018, 9:15a.m.)

These problems are assigned from Engineering Signals and Systems in Continuous and Discrete Time Second Edition by Ulaby/Yeagle (2016) (pages 79-84):

Inan problem # 3: Linear and/or time-invariant system?

For each of the following systems, find whether the system is (i) linear and (ii) time

invariant: (a) $y(t) = 2x(t) - 3$; (b) $\frac{dy(t)}{dt} + ay(t) = bx(t) + c \frac{dx(t)}{dt}$

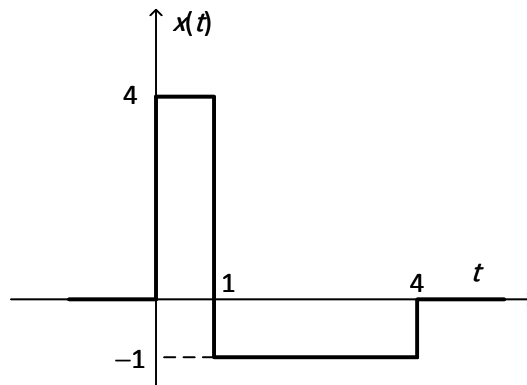
(c) $y(t) = \int_{-\infty}^t x(\tau) d\tau$; (d) $y(t) = 3 \cos[x(t)]$; (e) $y(t) = \frac{2}{x(t)}$

2.2. Parts (b), (c) & (e). Linear, time-invariant (LTI) systems.

2.3. Impulse and step responses of an LTI system.

Inan problem # 4: Impulse and unit-step responses of an LTI system.

Find the impulse response of the LTI system whose unit-step response is as shown:



2.5. Parts (a) & (c). Response of an LTI system.

2.7. Pulse response of an RC circuit.

Inan problem # 5: Unit-ramp response of an LTI system.

The unit-ramp response of an LTI system is given as $y_r(t) = \frac{1}{2}(1 - e^{-2t})u(t)$. Find:

(a) The unit-step and the impulse responses of the LTI system.

(b) Find the response due to the input signal $x(t) = 2u(t-1) - 4\delta(t-2) + 3r(t-4)$.

(c) Find the response due to the input signal $x(t) = 4\text{rect}\left(\frac{t-3}{2}\right)$.

**2.8*. Parts (a) & (b). Response of an RC circuit using superposition.
*Optional.**

Please use the following guidelines for your homework solutions:

- 1) On the first sheet, at the top center, write: Homework #2-Solutions.
- 2) Provide your full name on the upper right corner of the first sheet.
- 3) Also write: EE 262/Spring 2018 on the upper left corner of the first sheet.
- 4) Solve each problem on a separate sheet unless your solution is very short.
- 5) Box all of your answers.
- 6) Staple your solutions in the above order before you turn them in.

Please turn in your homework on time.