Zewail City for Science and Technology Nanotechnology Engineering Program Assignment 3 NANENG 461 Communication Theory and Systems Spring 2020

## Problem 1

Compute the Fourier transform of each of the following signals:

1- 
$$e^{-3|t|}\sin(2t)$$

2- 
$$\delta(t+1) + \delta(t-1)$$

## Problem 2

Compute the Inverse Fourier transform of each of the following signals:

1- 
$$X(j\omega) = 2\pi\delta(\omega) + \pi\delta(\omega - 4\pi) + \pi\delta(\omega + 4\pi)$$

$$2- x(j\omega) = \begin{cases} 2 & 0 \le \omega \le 2 \\ -2 & -2 \le \omega \le 0 \\ 0 & |\omega| > 2 \end{cases}$$

## Problem 3

- Determine which of the following properties hold and which do not hold for each of the following continues time systems. Justify your answer. X(t) is the system input while y(t) is the system output?
- Memoryless
- Causality
- Linearity

a. 
$$y[n] = x[n-2]-2x[n-8]$$

b. 
$$y[n] = nx[n]$$

c. 
$$y(t) = x(t^3)$$