UNIVERSITY of HOUSTON | ECE

ECE 3337: Signals & Systems Analysis
Worksheet 1

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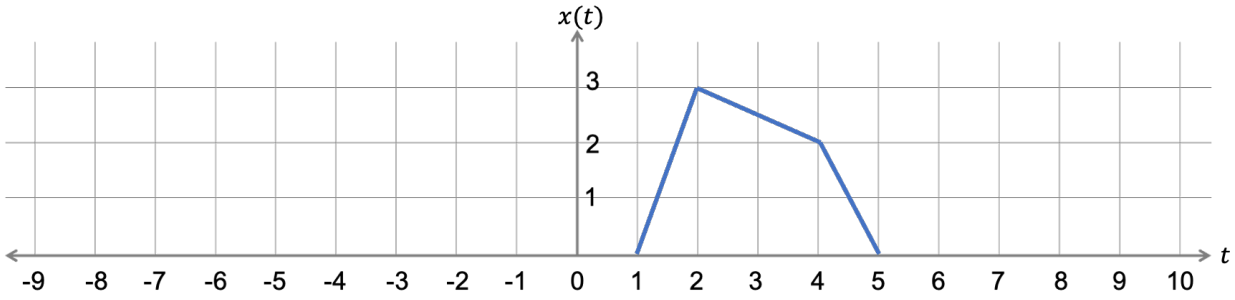
1. (70 points) Consider the following waveform $x(t)$:



Hand plot the following waveforms as a function of t :

a. $y_1(t) = x(0.25t)$. Does this transformation compress or expand the waveform in time?
b. $y_2(t) = x(2t)$. Does this transformation compress or expand the waveform in time?
c. $y_3(t) = x(-2t)$
d. $y_4(t) = x(2t+3)$ using Approach #1 (time scale followed by time shift)
e. $y_5(t) = x(2t+3)$ using Approach #2 (time shift followed by time scale). Does your answer match the one with Approach #1? It should!
f. $y_6(t) = x(-2t+3)$ using Approach #1
g. $y_7(t) = x(2t-3)$ using Approach #2

2. (15 points) Hand plot the following three signals on a single chart:

a. $x_1(t) = \sin(t)$
b. $x_2(t) = \sin(2t)$
c. $x_3(t) = \sin(2t - \frac{\pi}{2})$

3. (15 points) Modify the MATLAB sample code provided below to verify your answer to 1(d). Submit your code, and plots of the input and output signals.

MATLAB EXAMPLE: Basic Signal Transformations

Editor – /Users/badrinathroysam/Documents/MATLAB/Ch1_Example1.m *

Ch1_Example1.m *

```
%
% ECE 3337 Signals and Systems Analysis
% University of Houston
% Chapter 1 Example 1-1: Basic Signal Transformations

clear; % always start by clearing the workspace

%define the symbols
syms t x(t) y(t);

time = -10:0.01:10; % define an array of time points at which functions are calculated
ticks = -10:1:10; % array of tick marks for time axis

% waveform for Example 1-1 in the textbook
x(t) = piecewise(t < -3, 0, (-3<t)&(t<-2),t+3, (-2<t)&(t<0), 1, t>0, exp(-t));
y(t) = x(-2*t+6); % define the output function

% Plot x(t) and y(t)
figure; plot(time,x(time),time,y(time),'LineWidth',2);
title('Signal Transformations')
xticks(ticks);
xlabel('t(sec)','FontSize',12,'FontWeight','bold');
ylabel('y(t)','FontSize',12,'FontWeight','bold');
grid;

% Pause for the user to press a key and close the figure
fprintf('Press any key to close the figure and return to the command line\n');
pause;
close all;
```

This is what the output should look like: