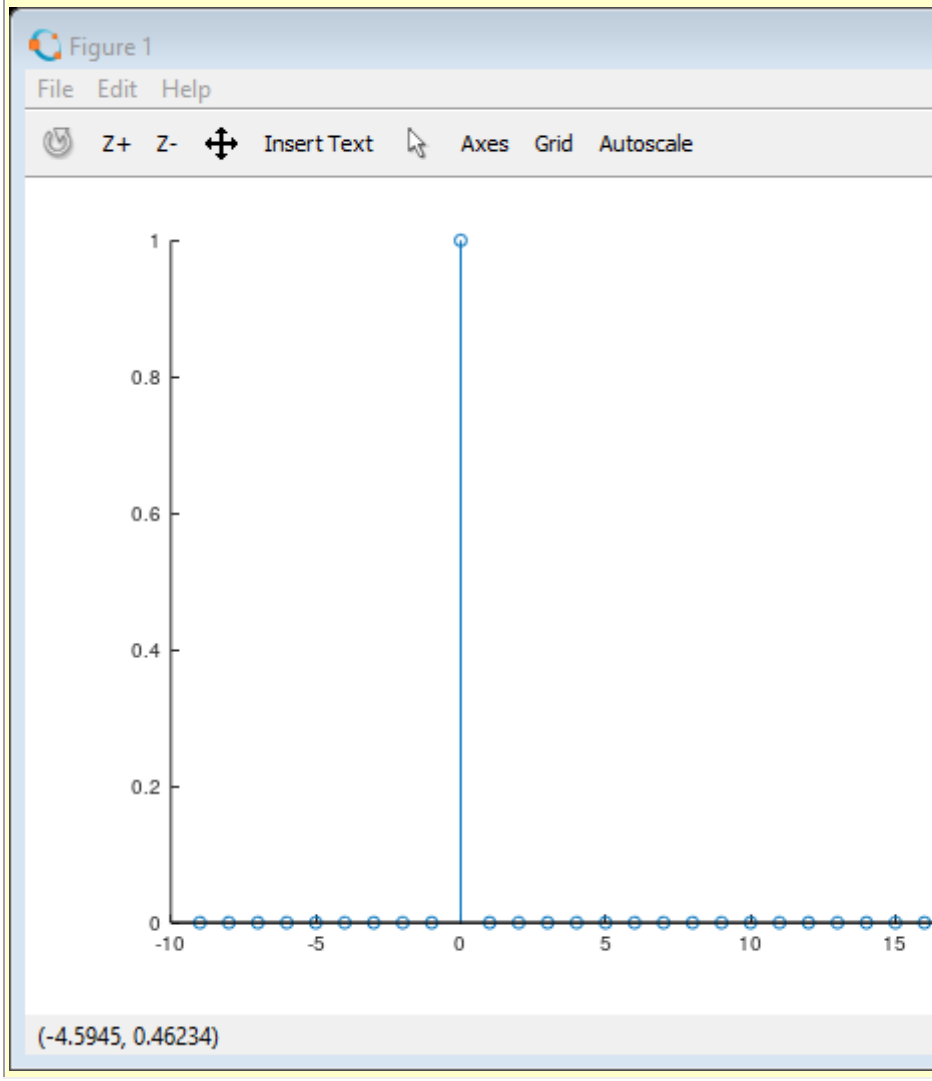
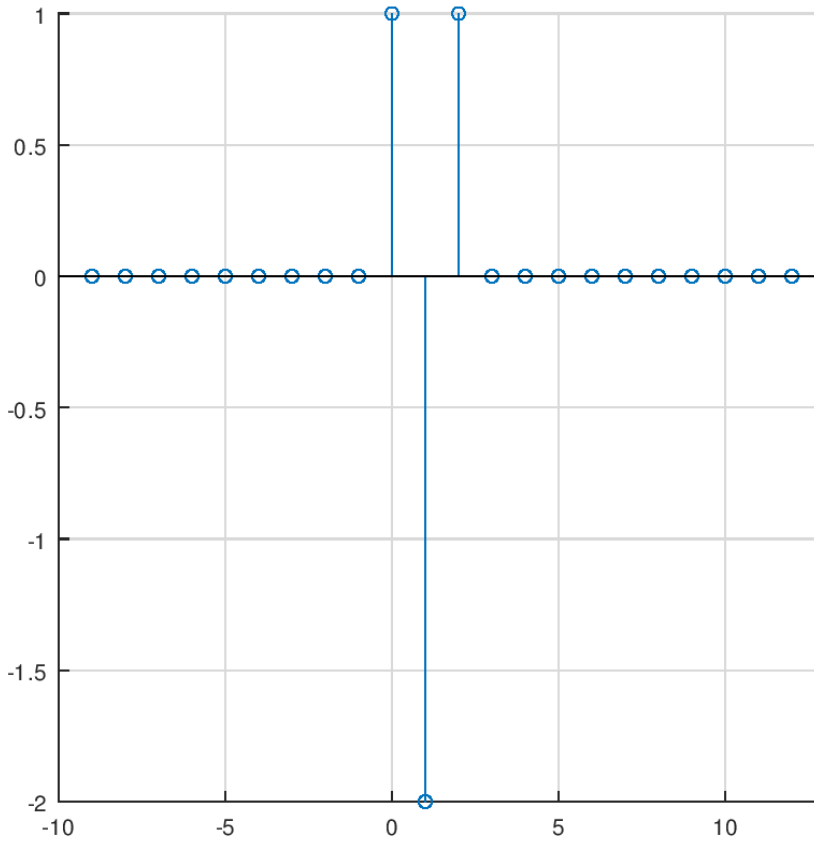
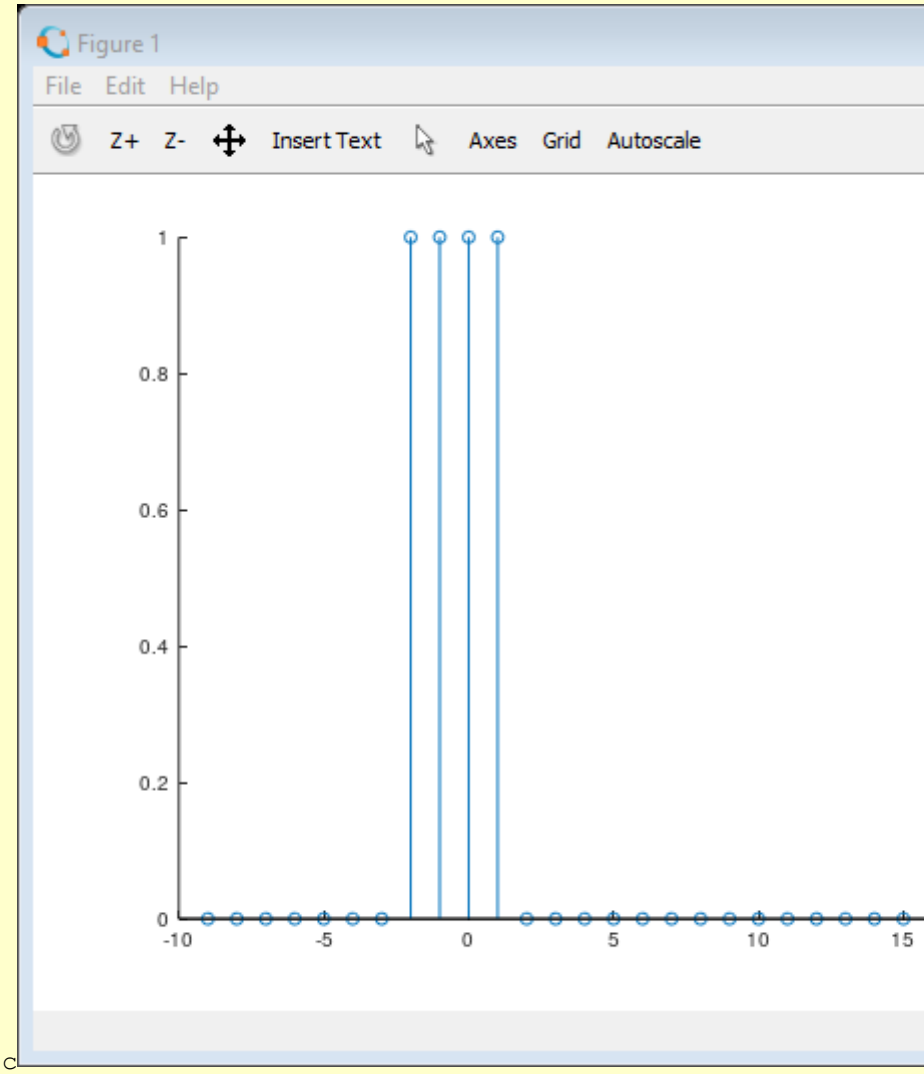
TX00CQ31 – Digital Signal Processing

Study 1: Basics	Name(s): Arsi Arola	ID(s): 1706768	Deadline: Exercise 2

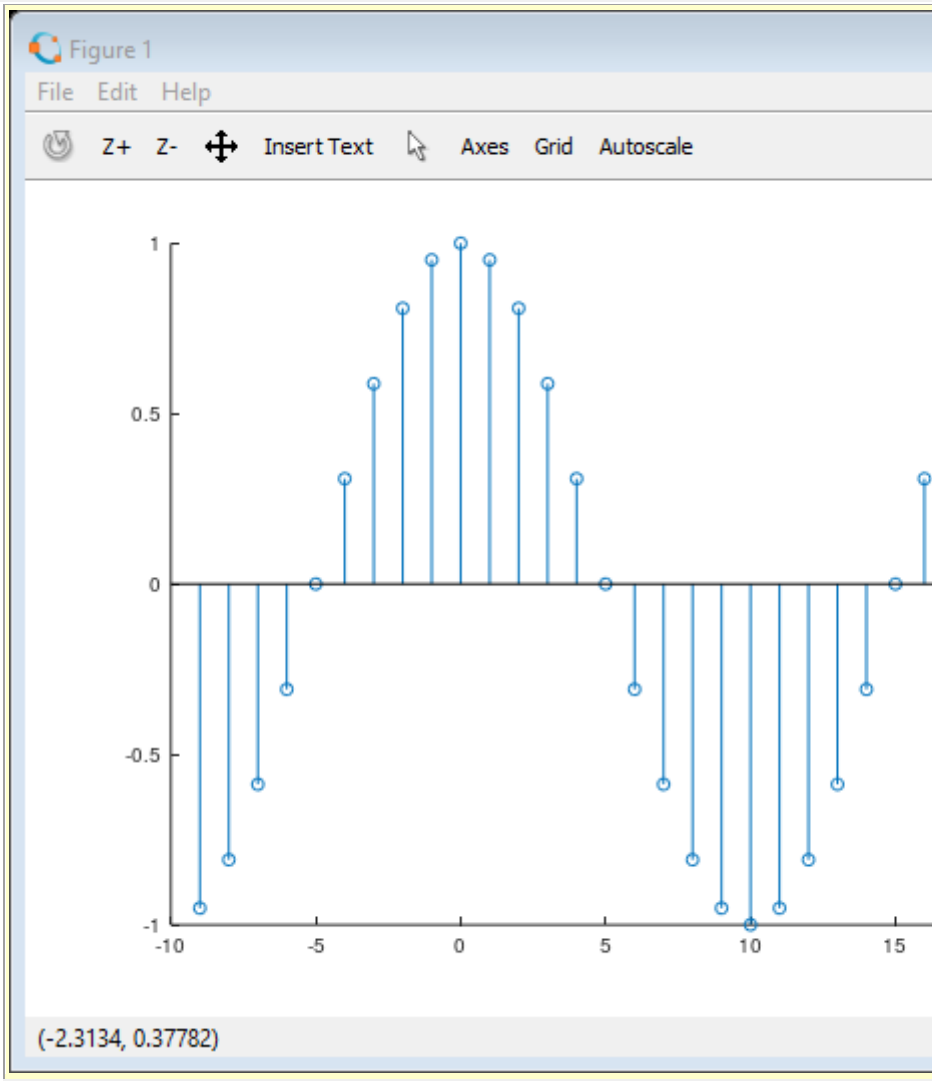
Read the lab instructions first!

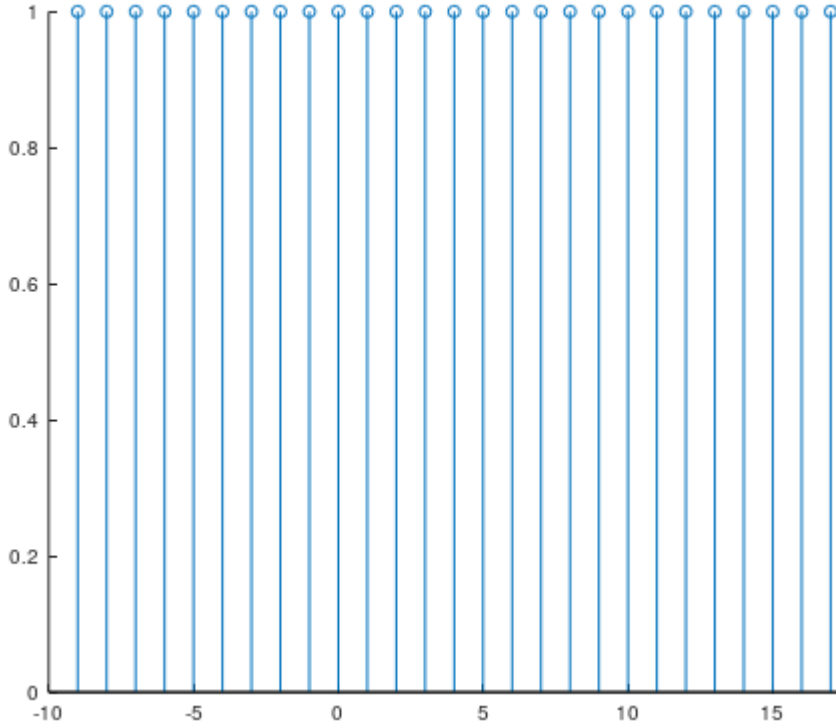
Number	Questions	Write your answer in this column
0	This is an example row, showing how to produce a vector of ones	`oo = ones(1,8) ; % variable name = oo`
1	Create an index-vector from -9 to 20	`[-9:20];`
2	Use the previous vector to generate a unit step function	`d = @(n) (n == 0)` 
3	Create a unit impulse function	u = @(n) (n >= 0)

4	Create a data sequence: (see exercise 1.1 a)
	x1[n] = d[n-2] + d[n] - 2d[n-1]
		`x1 = d(n-2) + d(n) - 2*d(n-1)`
		`stem(n,x1)`
		 

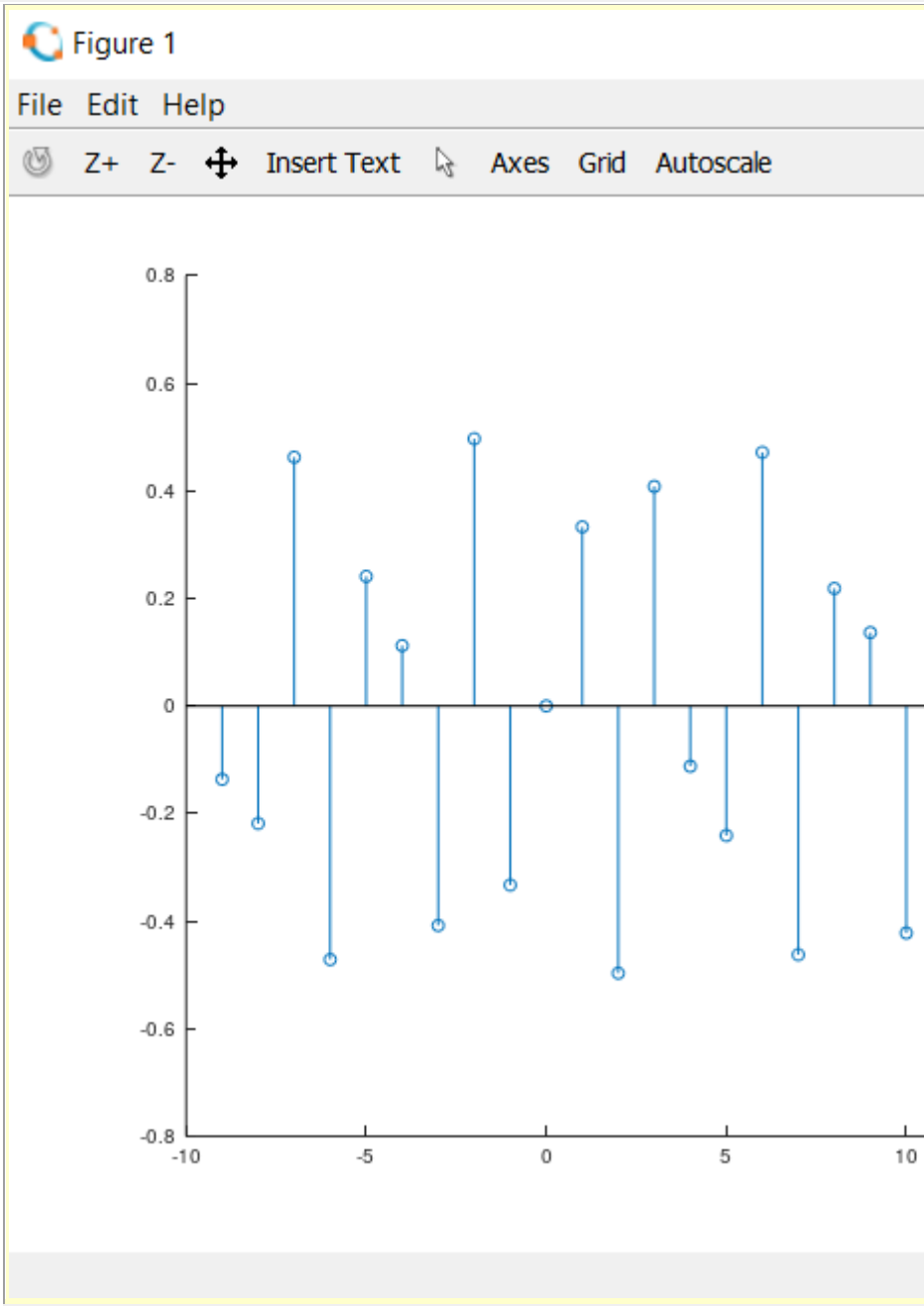
5	Create a data sequence: (see exercise 1.1 b)
	x2[n] = u[n+2] - u[n-2]
		`x2 = u(n+2) - u(n-2)`
		`stem(n,x2)`
		 

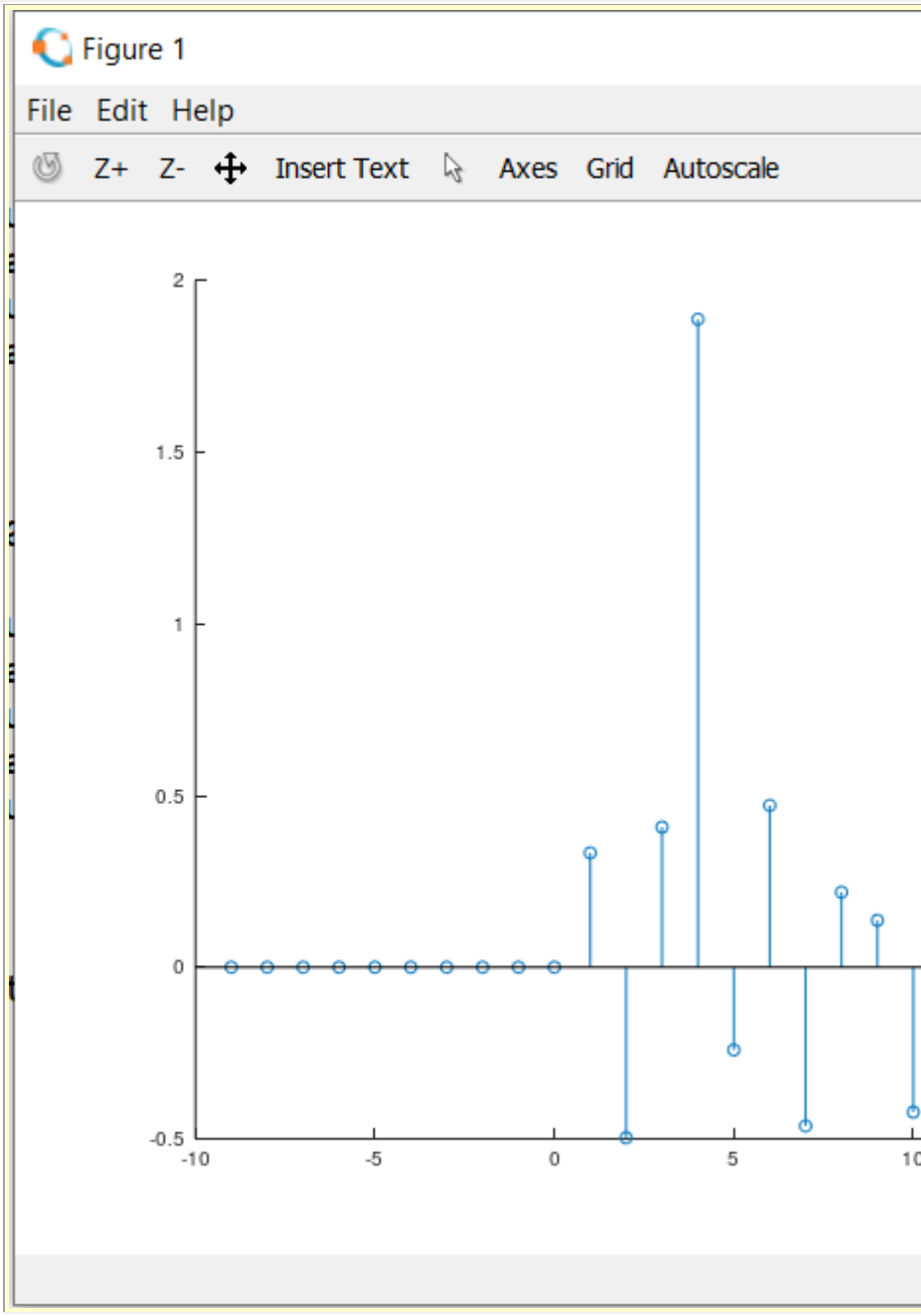
6	Create a data sequence: (see exercise 1.1 c) x3[n] = cos(0,1 pi n)	`x3 = cos(0.1 * pi * n)` `stem(n,x3)`

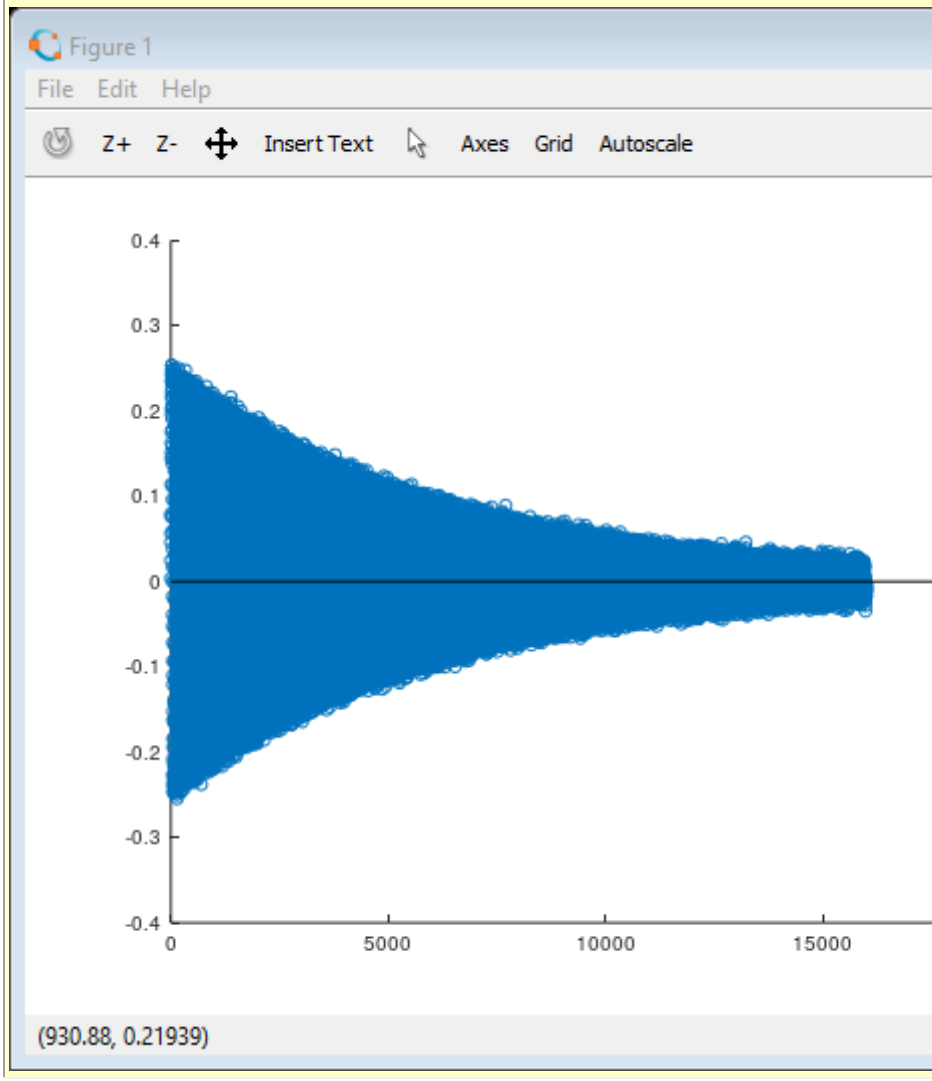
		
7	Create a data sequence: (see exercise 1.1 d) x4[n] = cos(2 pi n)	`x4 = cos(2 * pi * n)` `stem(n,x4)`

8	Use your index-vector of Question 1 to produce the sampled data vector of a sine wave with
	
	• Amplitude of 0.5
	• Signal frequency of SSS
	
	Hz
	
	• Sampling rate of 2000 s^{-1}
		`A = 0.5`
		`f = 768`
		`fs = 2000`
		`data8 = A*sin(2*pi*(f/fs)*n)`
		`stem(n,data8)`

		
9	Create a data sequence: x[n] = u[n]*s[n] + 2*d[n-4] where, u[n] = unit step function s[n] = previous, sampled sine d[n] = delta function	Write the commands! ('.*' elementwise multiplication) data9 = u(n).*data8 + 2*d(n-4); stem(n,data9)

10	Stem-plot the previous data vector	

11	Generate a sound sample which consists of
	
	• 8000 s^{-1} sampling rate
	• 2 second long sample
	• Decaying sine wave
	  ○ Maximum amplitude 0.25
	  ○ Amplitude decays exponentially with time constant of SSS ms
	  ○ Signal frequency (2*SSS) Hz
	• Random noise, standard deviation of 0.005
		`fs = 8000; % Sampling frequency`
		`SSS = 768;`
		`f = 2*SSS`
		`n = 0:(2*fs)-1;`
		`A = 0.25*exp(-(n/fs)/(SSS/1000));`
		`s = A.sin(2*pi*(f/fs)*n);`
		`sRand = s + 0.005 * randn(1,2*fs);`
		`stem(n,sRand)`
		
		 

12	Listen to your sound sample	`Describe how it sounds like! (sound())`
		`sound(sRand,fs)`
		
		`Some weird drum like instrument tapped slighty and it rapi`