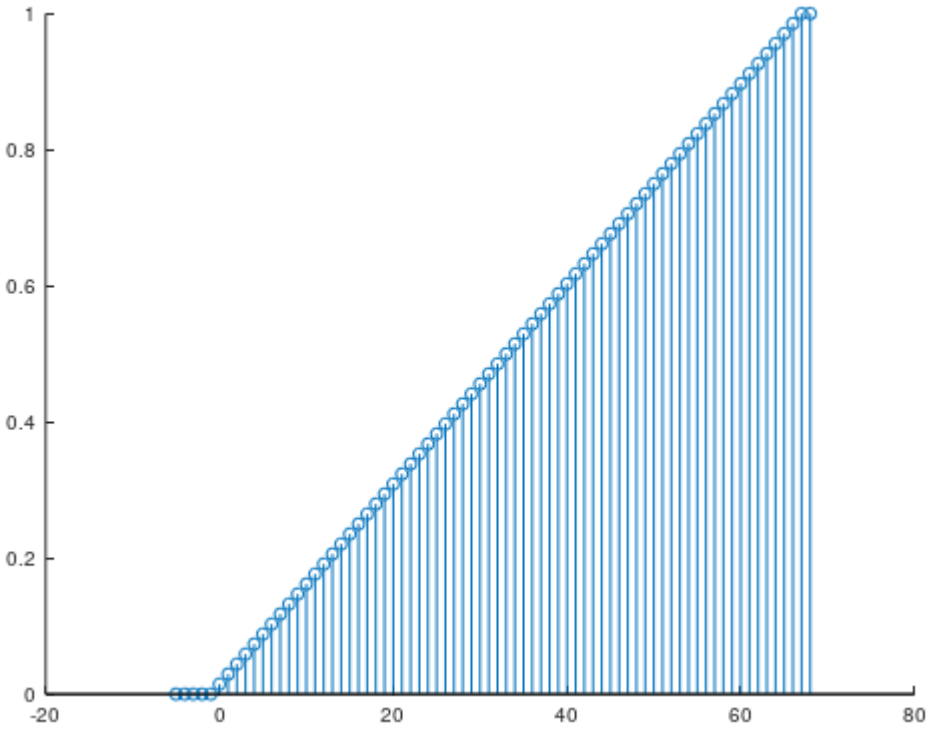
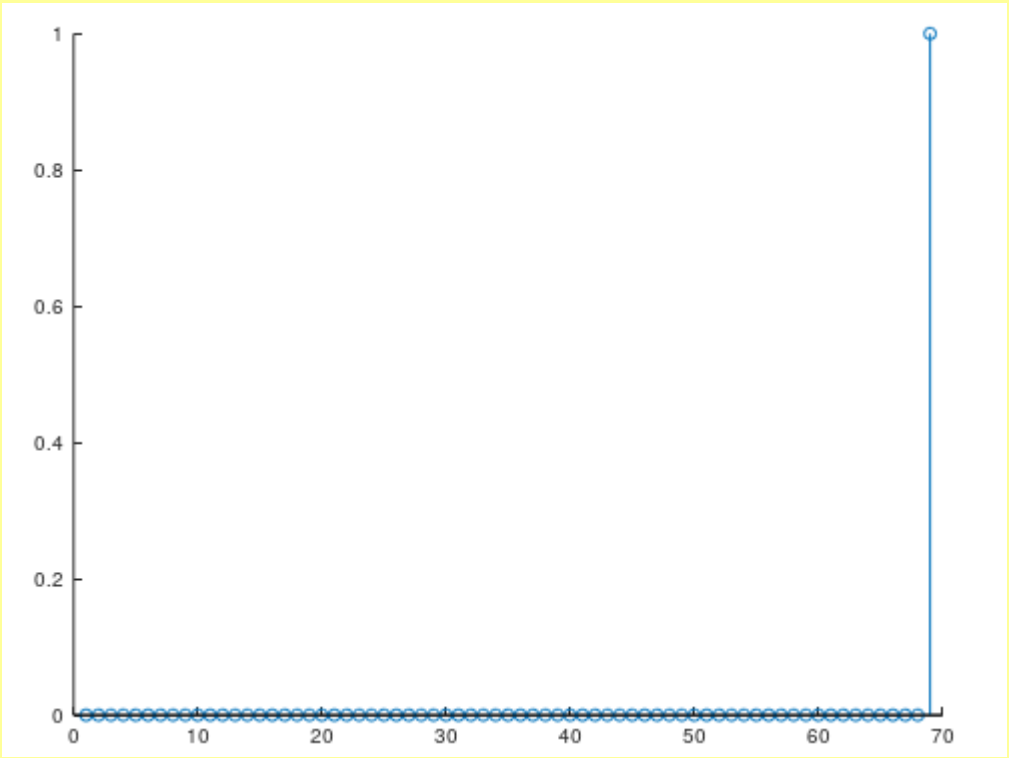
TX00CQ31 –Digital Signal Processing

Study 2: Time Domain	Name(s): Arsi Arola Mikko Larke	ID(s): 1706768 1805833	Deadline: Lab 3

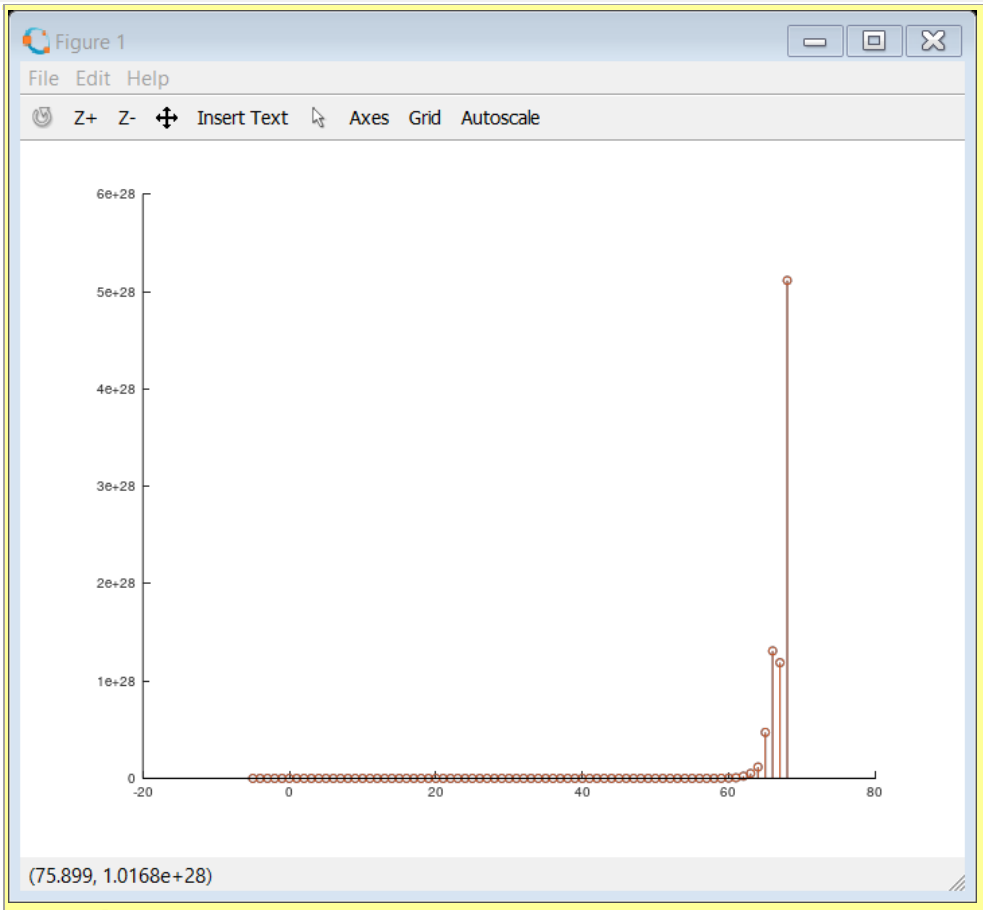
Read the lab instructions first!

Number	Write your answer in this column	Questions
1	SS = 68 s = 1/SS * ones(1,SS);	Generate an impul running average fi only two last digit

2	u = @(n) (n >= 0);
	SS = 68
	n = [-5:SS];
	h = 1/SS * ones(1,SS);
	stem(n, filter(h,1,u(n)));
	 
	
		Filter-function is a
		linear, time-invari
		be used to produce
		following way:
		yy = filt
		where hh
		response and
		signal
		Use filter function
		response for the av
		exercise.

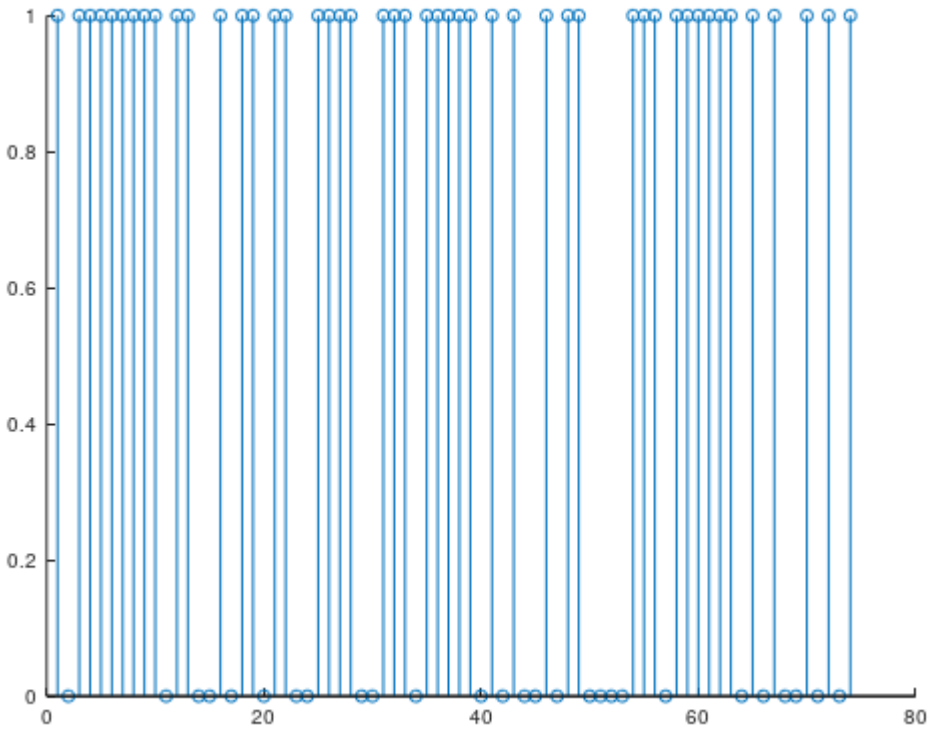
3	Write commands here!
	
	Insert a picture showing the delayed delta-function (impulse).
	d = @(n) (n == 0)
	n = [0:SS];
	`y1 = filter([zeros(1,SS) 1], 1, d(n))`
	stem(n, y1);
	
	 
	
		An easy way to pr
		Octave, is to use th
		following way:
		`filter([`
		Test this method t
		`delta[n-`

4 a	n = [-5:SS];
	y = @(x, n) (x .* exp(n));
	x1 = rand(1, length(n))
	x2 = rand(1, length(n))
	a = rand(1, 1)
	b = rand(1, 1)
	y1 = y(a*x1 + b*x2, n)
	y2 = a*y(x1, n) + b*y(x2, n)
	
	stem(n,y1)
	hold on
	stem(n,y2)
		Use appropriate te
		system
		
		`y[n] = x[n]*`
		is
		Linear



// visual comparison

stem(y1 == y2)



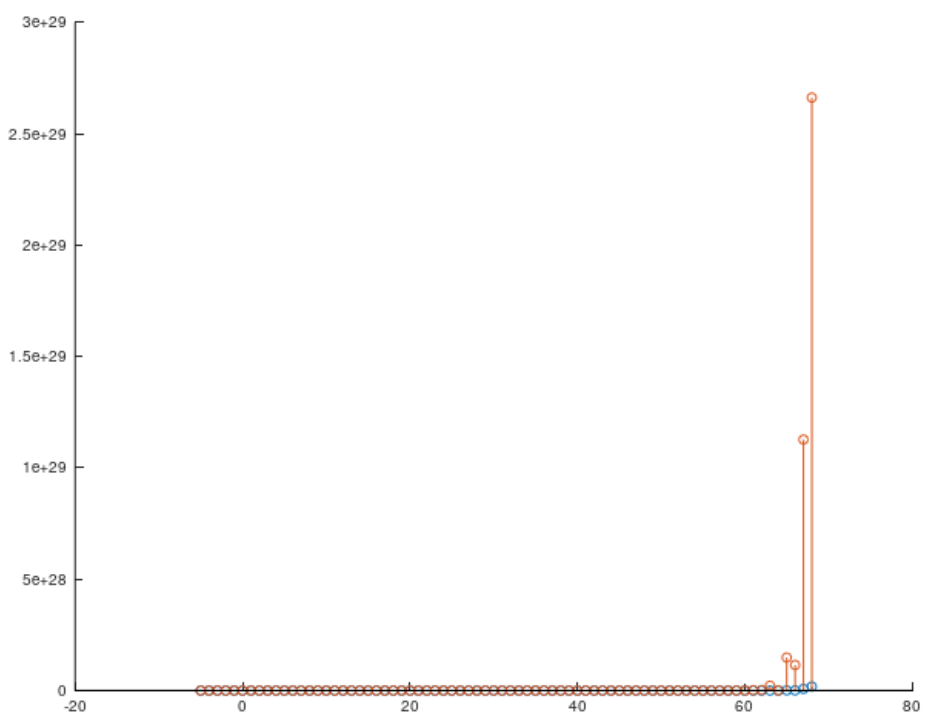
// Concrete comparison of the two functions, we can see that the values match in almost every case and when they dont match that is due the limitations of computer handling numbers with limited precision. We can also see from the visual comparison that actually the values are basically the same.

➔ Linear system

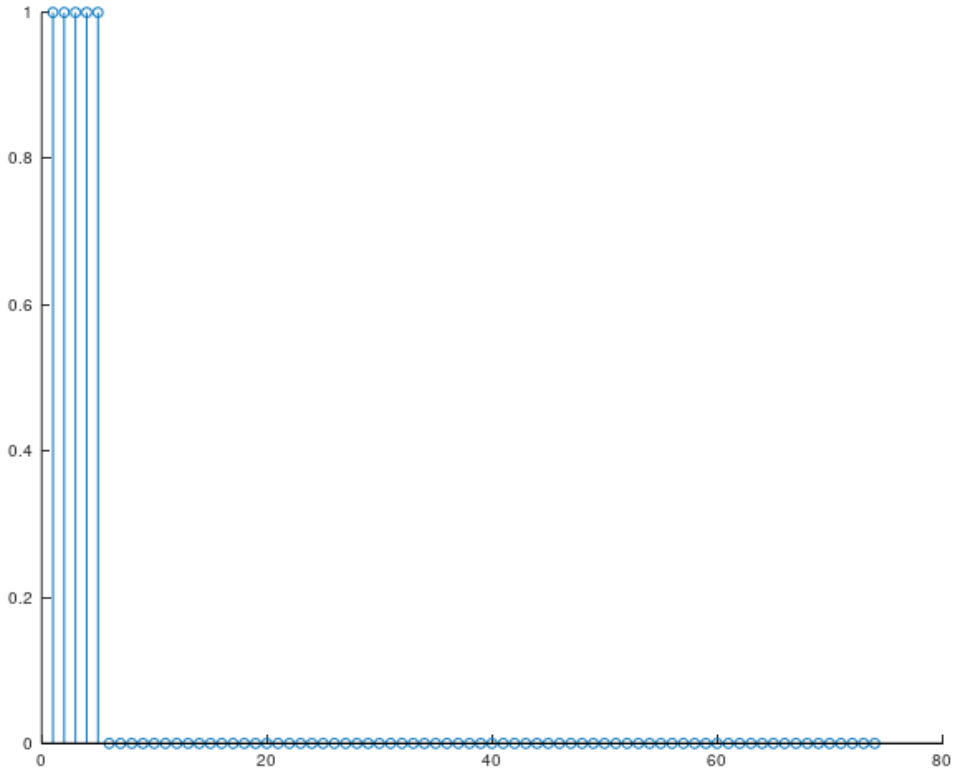
4 b

```
D = [zeros(1,5) 1]
n = [-5:SS];
x1 = rand(1, length(n))
y1 = filter(D, 1, y(x1, n))
y2 = y(filter(D, 1, x1), n)
stem(n,y1)
hold on
stem(n,y2)
```

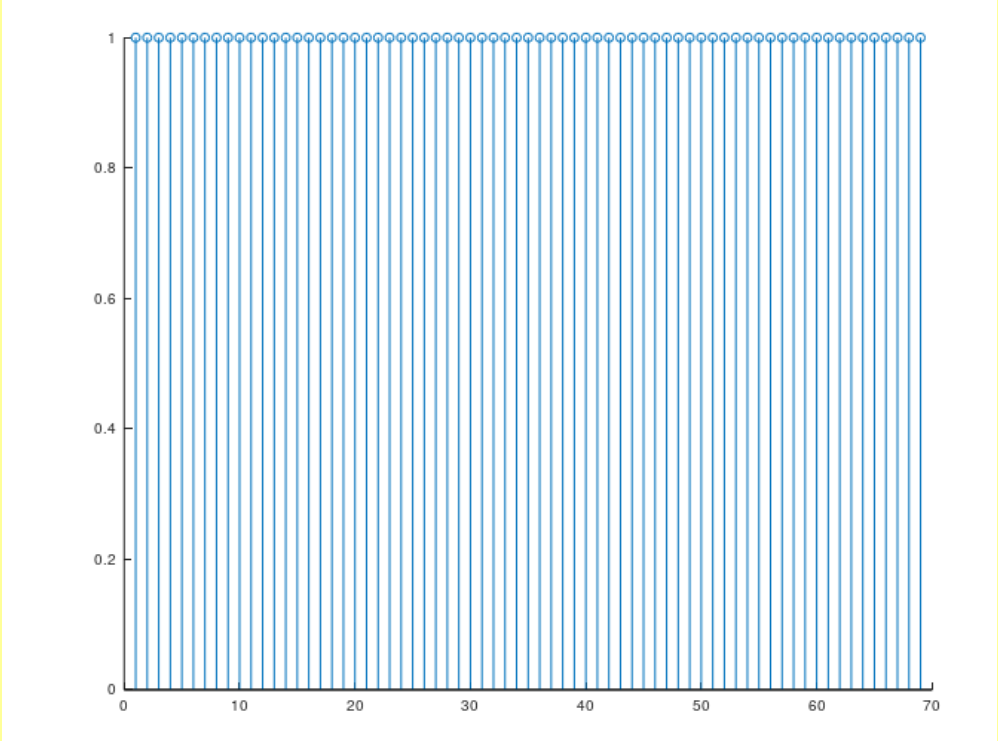
Time Shift Invaria



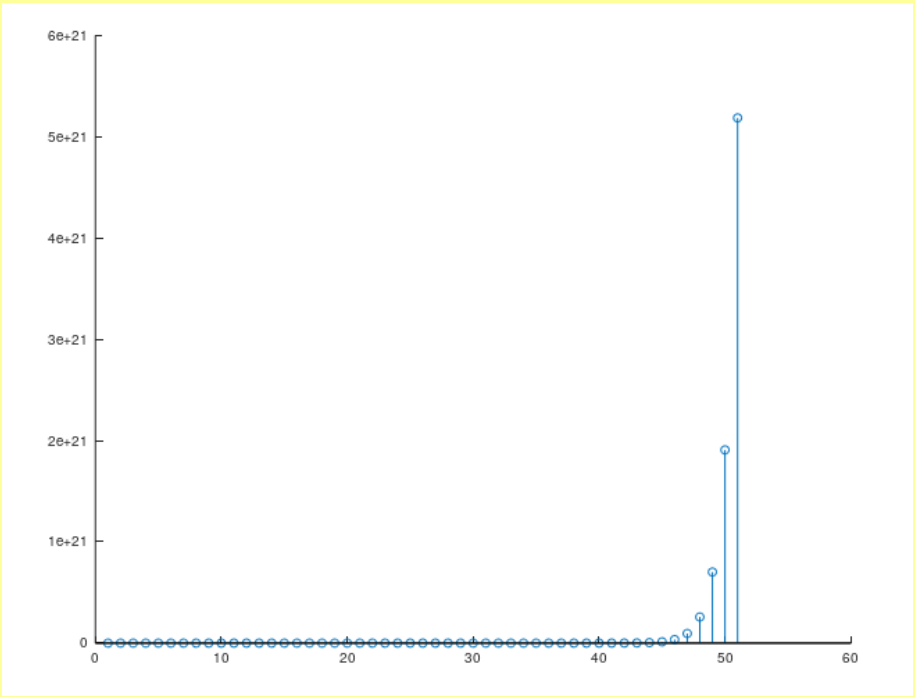
stem(y1 == y2)



// y1 and y2 are not equal at all points so the system is time NOT invariant

4 c	Justified answer required!
	range = [0:SS];
	n = [-length(range): -1]
	x1 = rand(1, length(n))
	stem(y(u(n) .* x1, n) == 0) % n < 0
	 
	// We can see that at every single point in the "*F{u[n]*q[n]} == 0 , when n < 0*" *results 1 meaning true so all values were equal to 0 and the system IS causal*
		Causal

4 d	Justified answer required! n = 0:50; y1 = abs(y(u(n), n)) stem(y1)	Stable



// Looking at the graph we can see that the system output increases as n increases so the system approaches infinity and is NOT stable

5

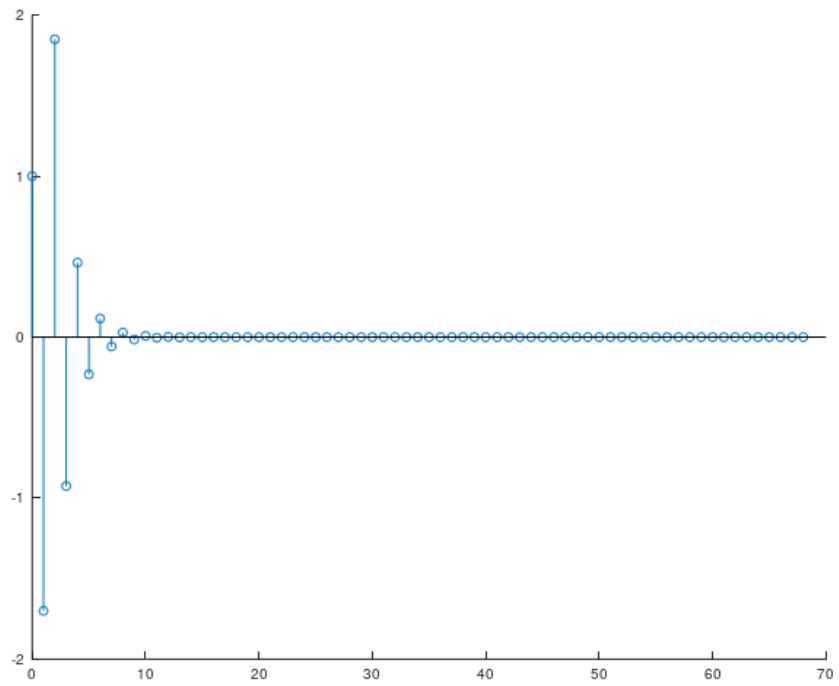
Insert the graph of impulse response function here.

```
SS = 68;
n = 0:SS;

a = [1 0.5 0];
b = [1 -1.2 1];

impulse = [1 zeros(1,SS)];

response = filter(b,a,impulse);

stem(n, response);
```

System difference

```
y[n] = x
2]-0.5*y[n-1
```

Generate SS point
function h[n].
Is the system FIR



The system is IIT system because of the past output sample

6

Write commands here

```
function y = delta(n)
    y = n == 0
endfunction
```

Write an m-functi
delta function valu