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## Part 1

---

```
%Using assignment 3 to calculate the value of R3 gave the value of  
%R3=55.4247. It is pretty clear the the circuit used is essentially acting  
%as an amplifier, increasing the voltage at the output.
```

```
[C,G] = MNPA()
```

```
C
```

```
G
```

C =

Columns 1 through 7

-0.0224	0.0224	0	0	0	0	0
0.0224	-0.0224	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0.2000	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0

Column 8

0  
0  
0  
0  
0  
0  
0  
0  
0

G =

Columns 1 through 7

1.0000	-1.0000	0	0	0	1.0000	0
-1.0000	-0.5000	0	0	0	0	1.0000
0	0	0.0180	0	0	0	-1.0000
0	0	0	10.0000	-10.0000	0	0
0	0	0	10.0000	10.0010	0	0

1.0000	-1.0000	0	0	0	0	0
0	1.0000	-1.0000	0	0	0	0
0	0	-1.8042	1.0000	0	0	0

Column 8

0
0
0
1.0000
0
0
0
0

C =

Columns 1 through 7

-0.0224	0.0224	0	0	0	0	0
0.0224	-0.0224	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0.2000	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0

Column 8

0
0
0
0
0
0
0
0

G =

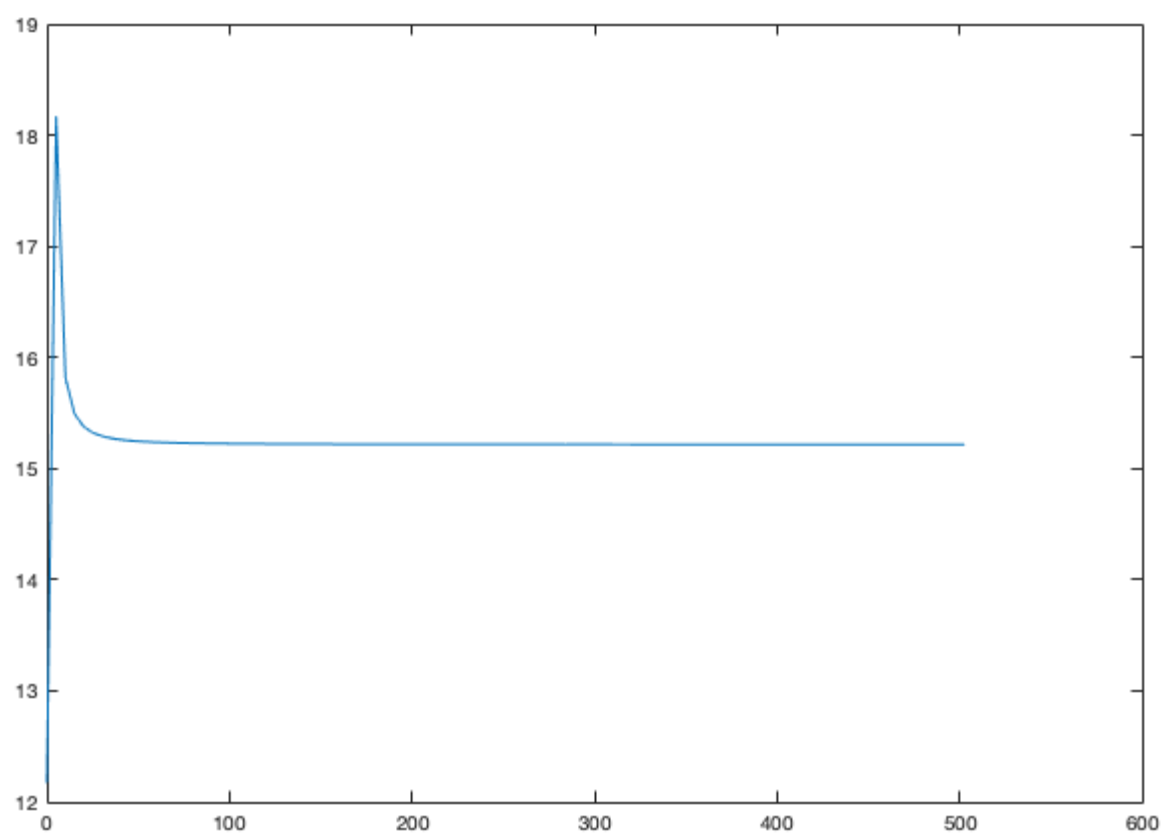
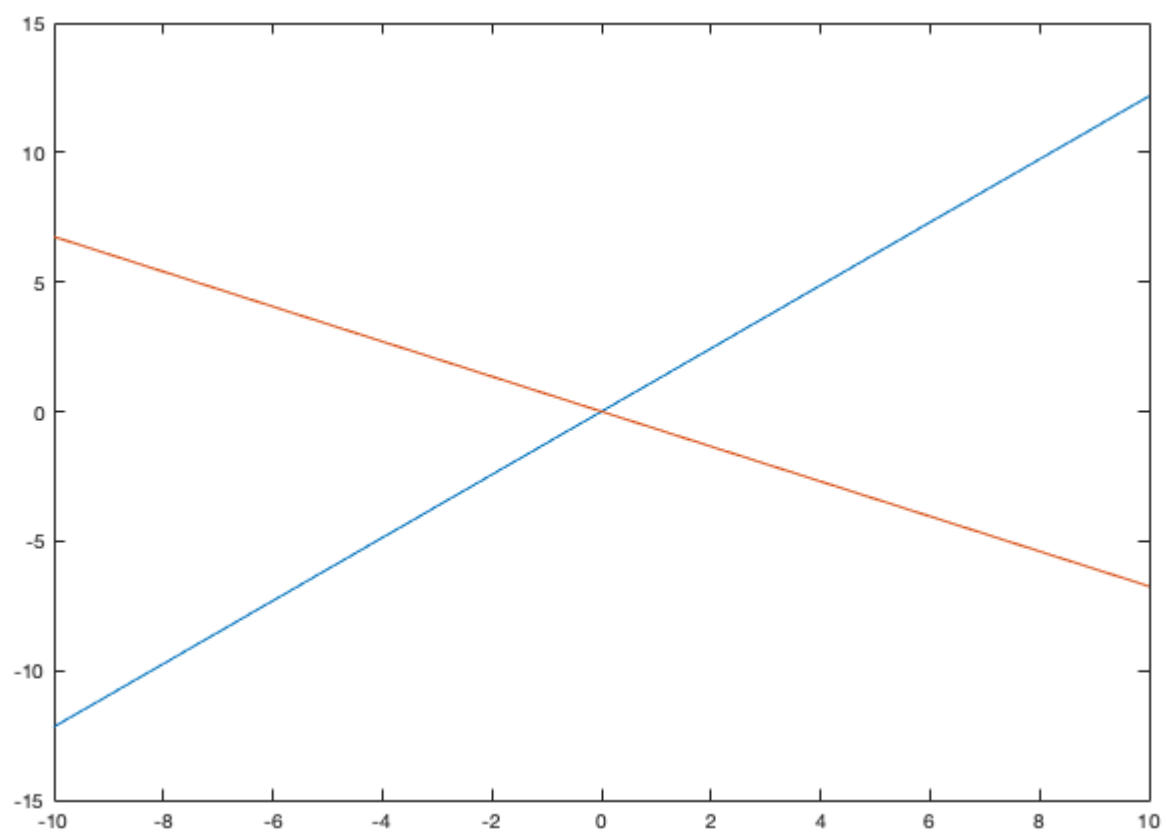
Columns 1 through 7

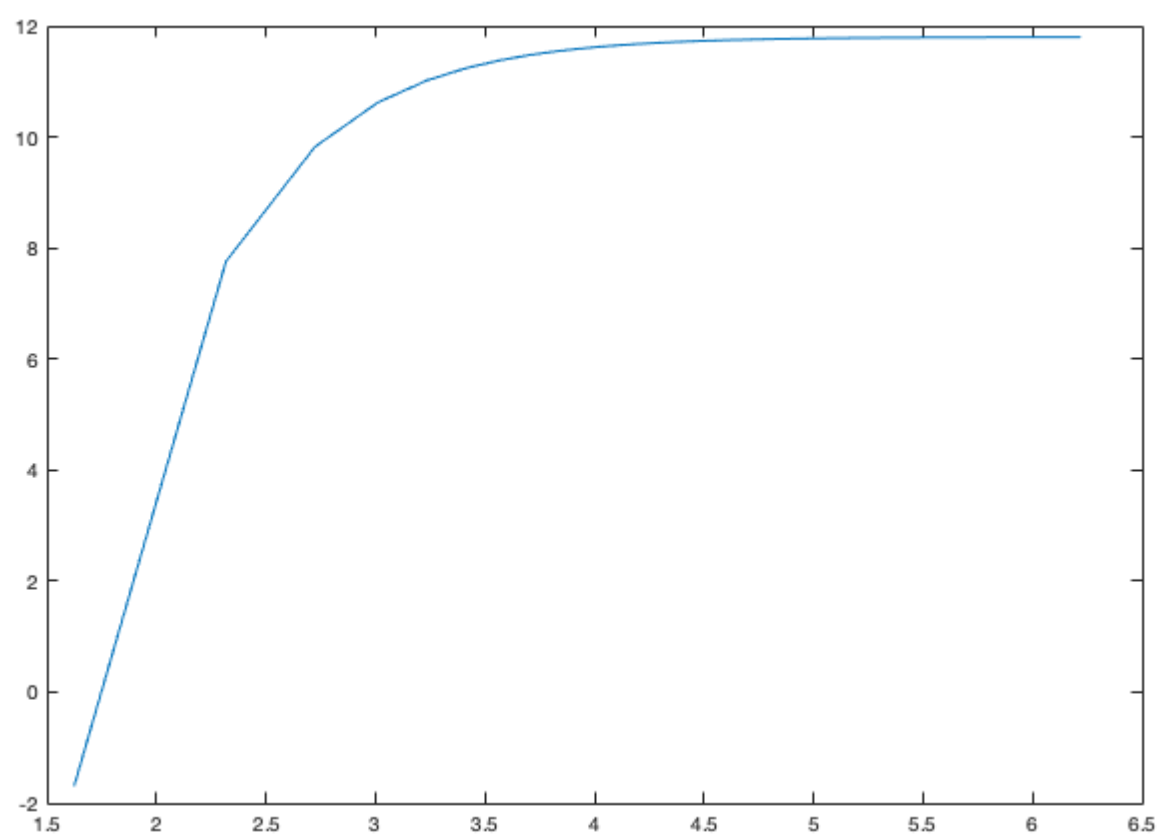
1.0000	-1.0000	0	0	0	1.0000	0
-1.0000	-0.5000	0	0	0	0	1.0000
0	0	0.0180	0	0	0	-1.0000
0	0	0	10.0000	-10.0000	0	0
0	0	0	10.0000	10.0010	0	0
1.0000	-1.0000	0	0	0	0	0
0	1.0000	-1.0000	0	0	0	0
0	0	-1.8042	1.0000	0	0	0

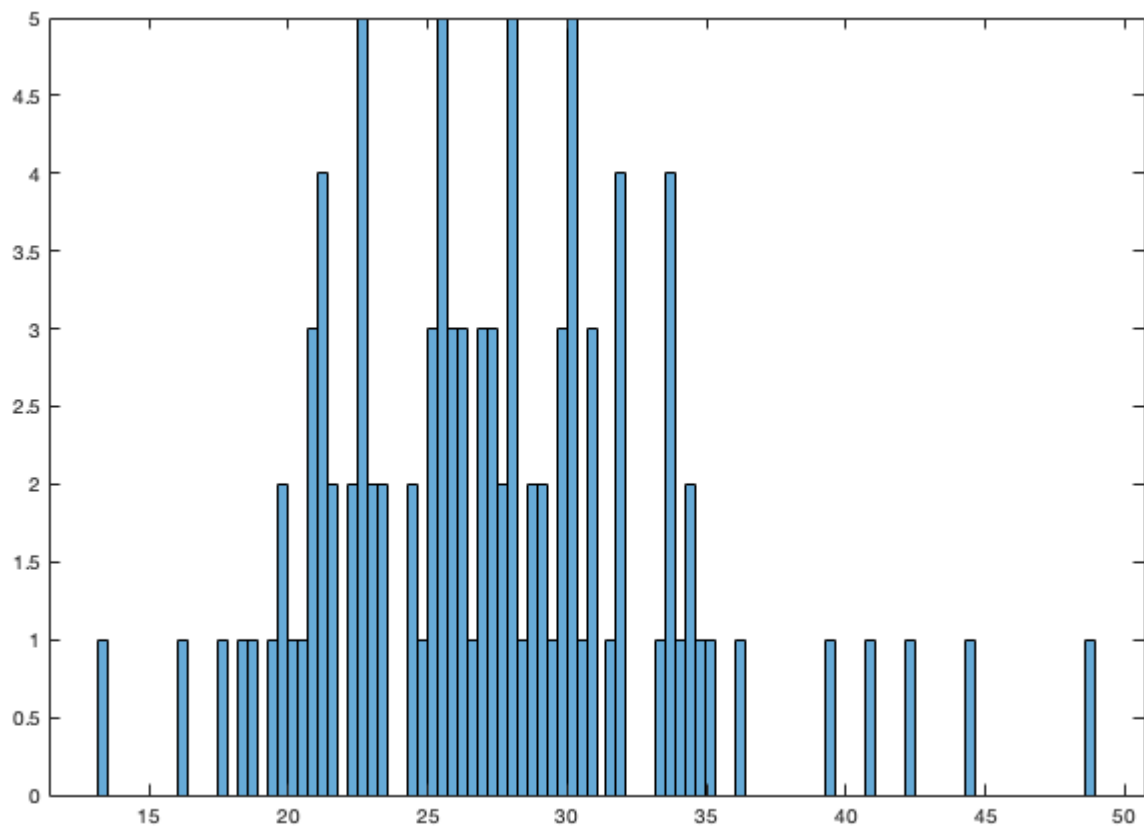
Column 8

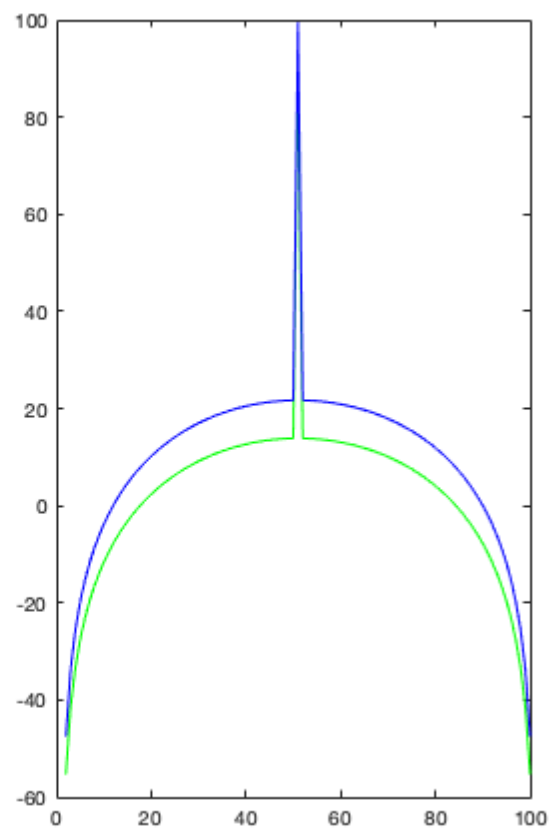
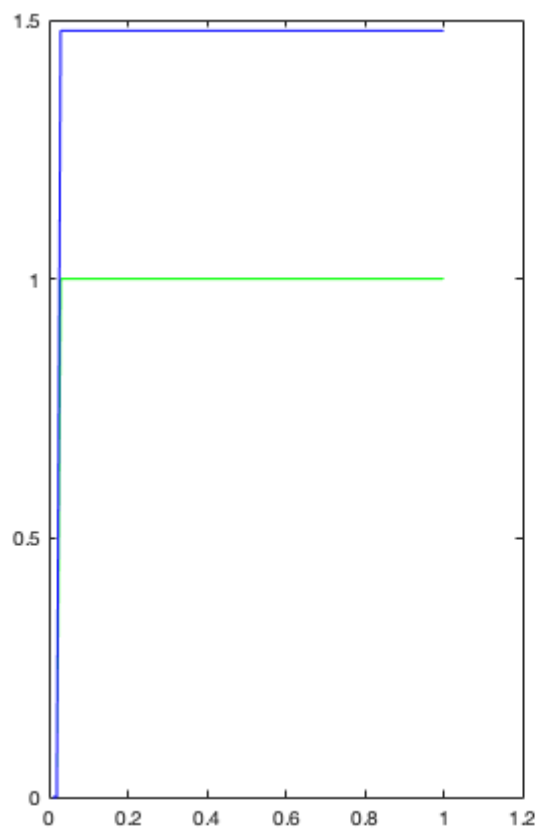
0
0
0
1.0000
0

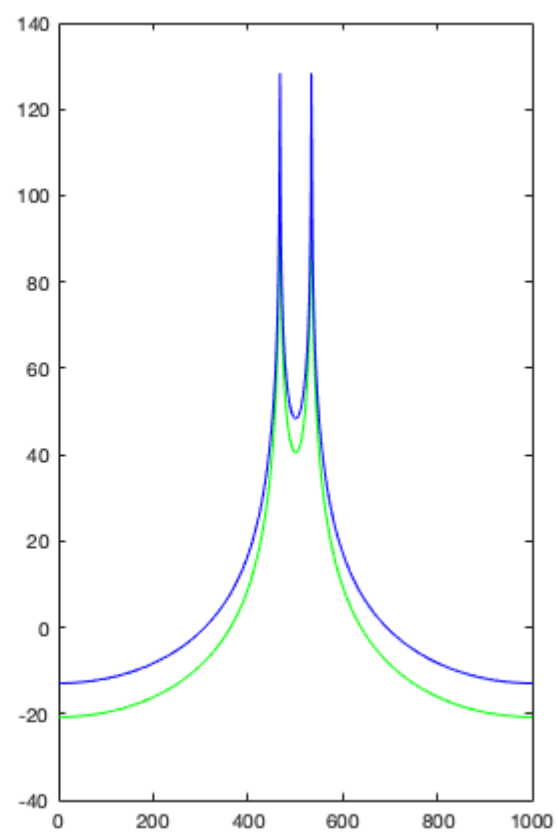
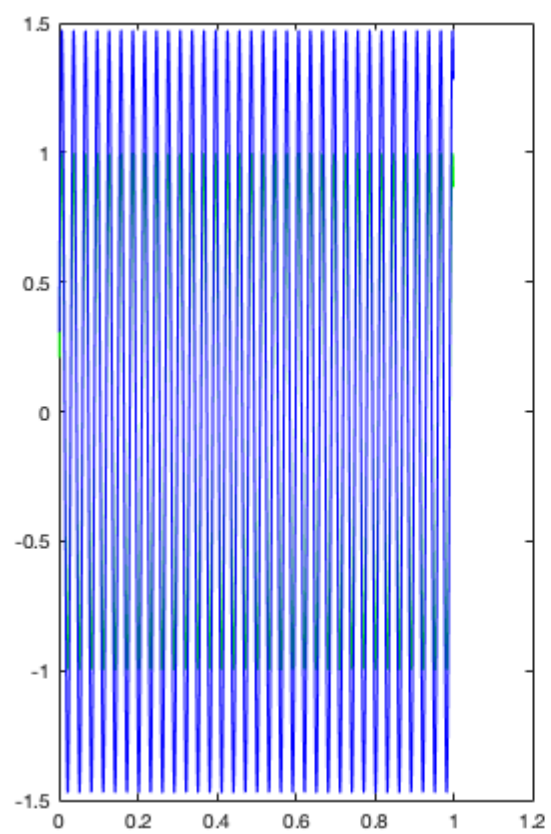
0  
0  
0



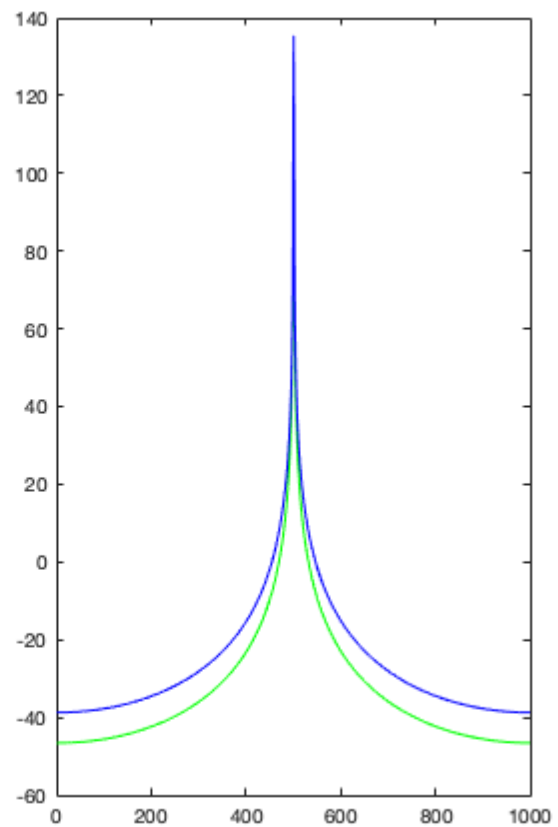
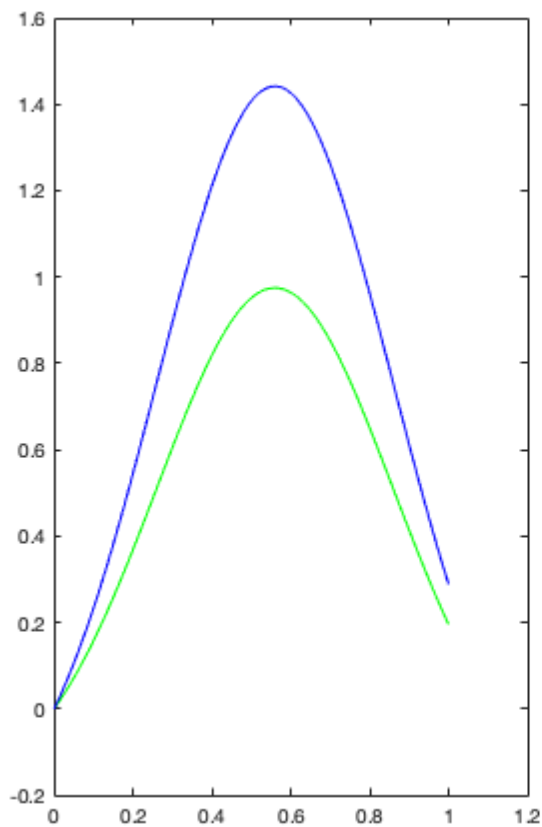












## Part 2

%When the capacitor is added it makes the a certain amount of time before  
 %the output voltage reaches its desired voltage. So when the capacitor cn  
 %is increased this means that it will take long for the output voltage to  
 %stablize at the desired output voltage. If cn is decreased then it will  
 %take less time for this to happen.

[C,G] = Noise()

C =

Columns 1 through 7

0	0	0	0	0	0	0
0.2500	-0.2500	0	0	0	0	0
0	0	0	0.0000	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0.2000	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0

Column 8

0  
 0  
 0  
 0

0  
0  
0  
0

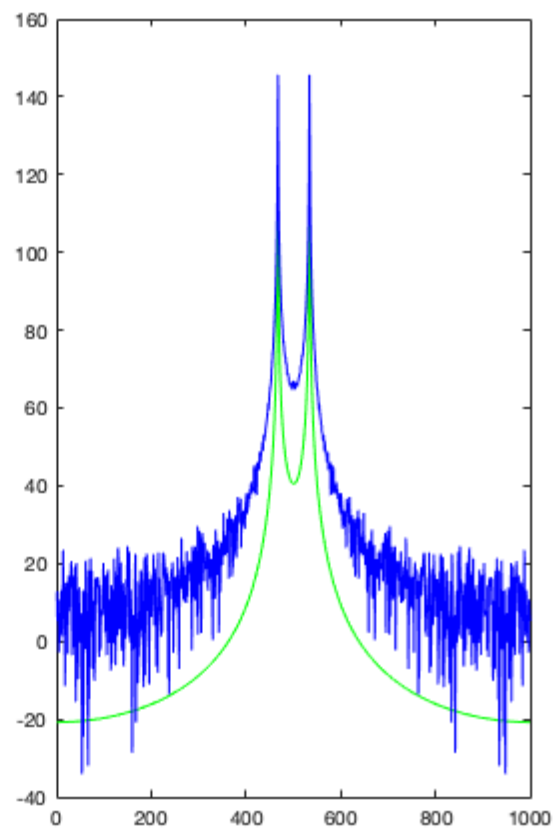
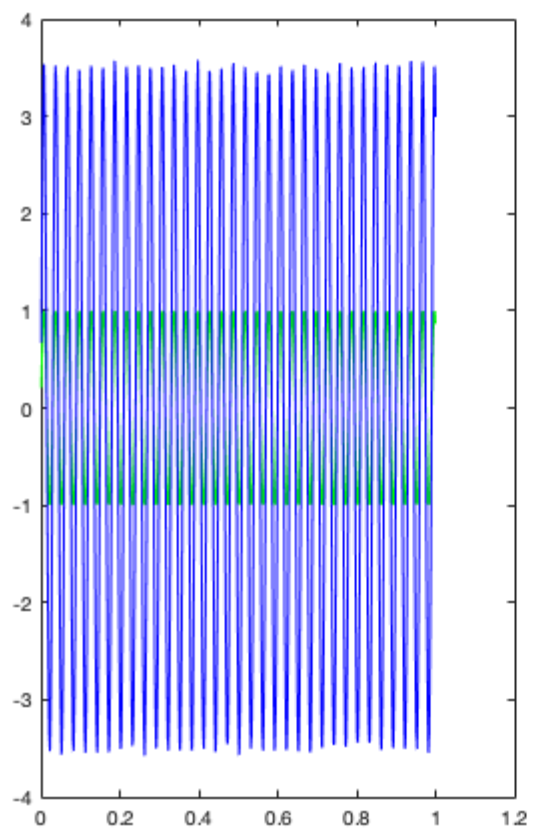
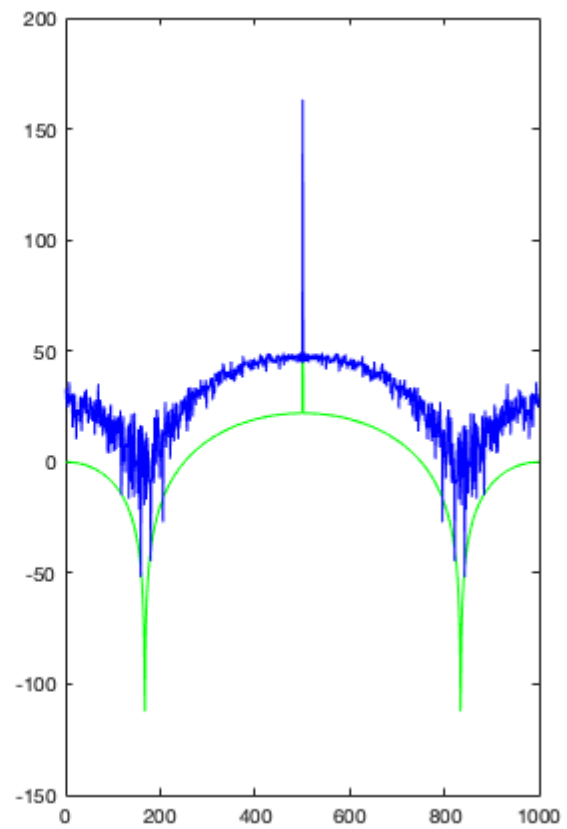
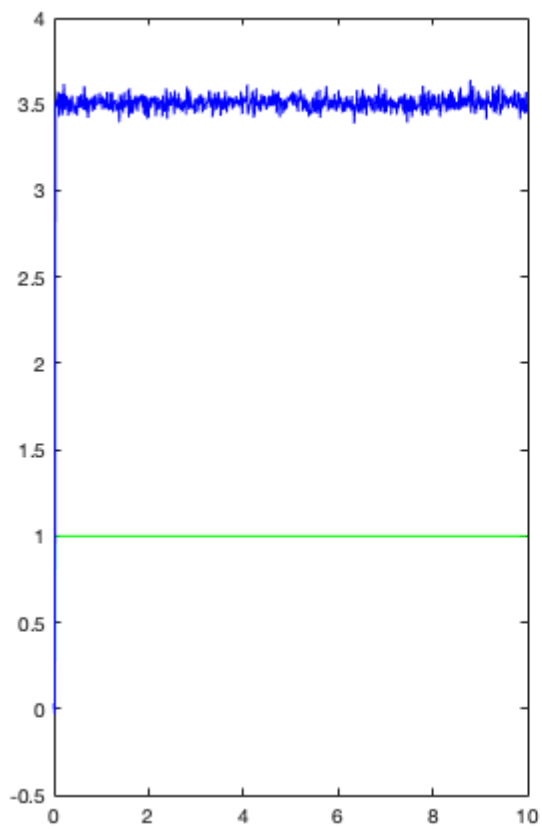
G =

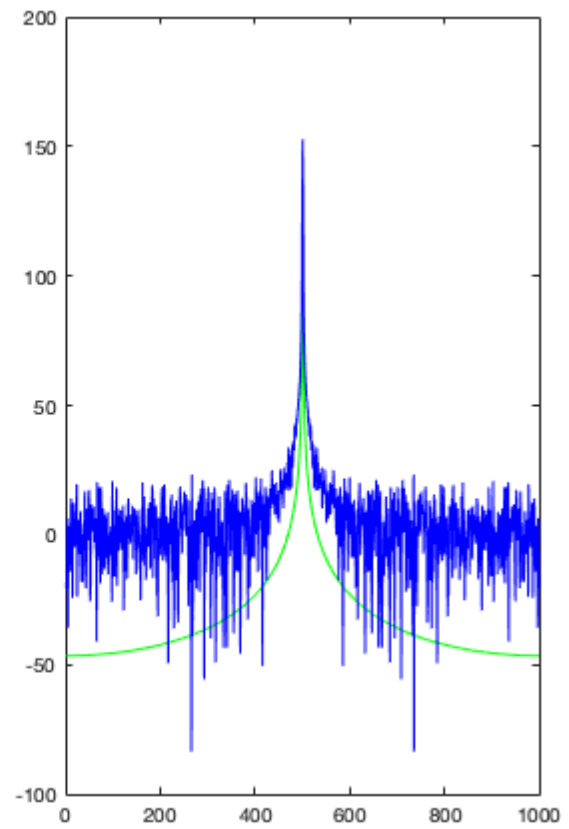
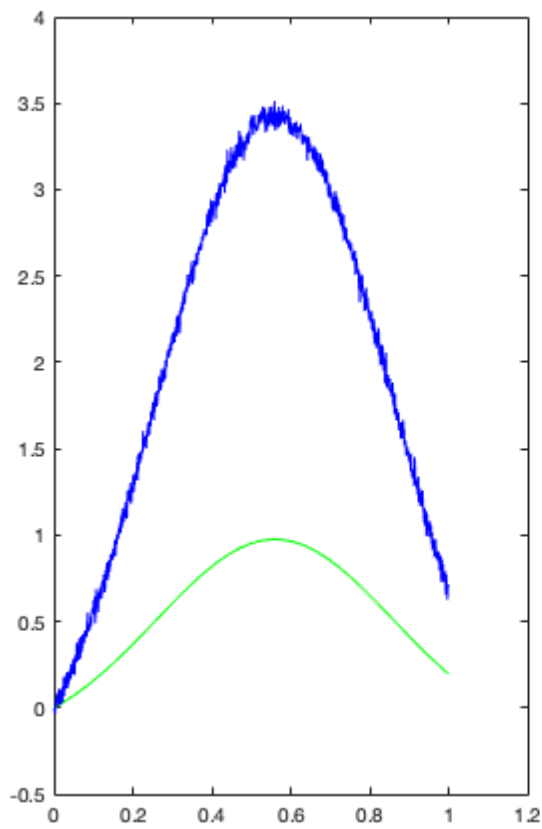
Columns 1 through 7

1.0000	-1.0000	0	0	0	1.0000	0
-1.0000	-0.5000	0	0	0	0	1.0000
0	1.0000	0.0180	0	0	0	-1.0000
0	0	0	10.0000	-10.0000	0	0
0	0	0	10.0000	10.0010	0	0
1.0000	-1.0000	0	0	0	0	0
0	1.0000	-1.0000	0	0	0	0
0	0	-1.8042	1.0000	0	0	0

Column 8

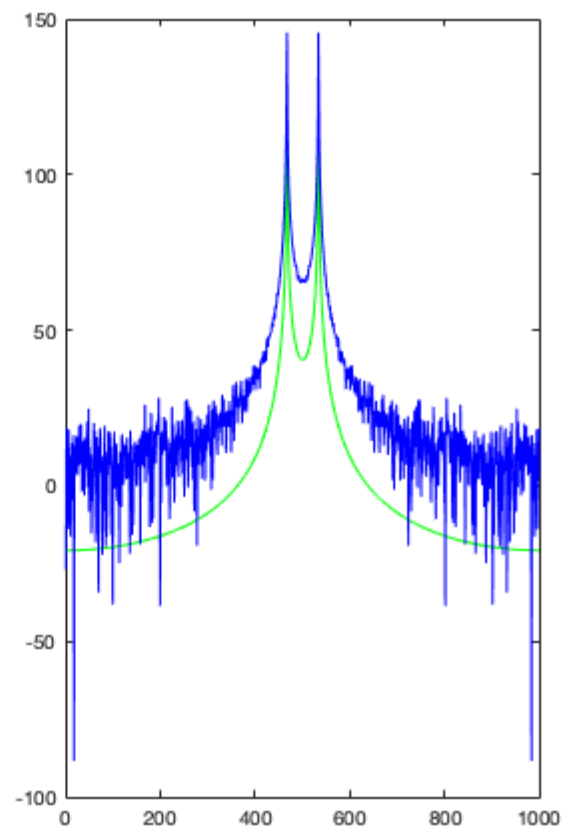
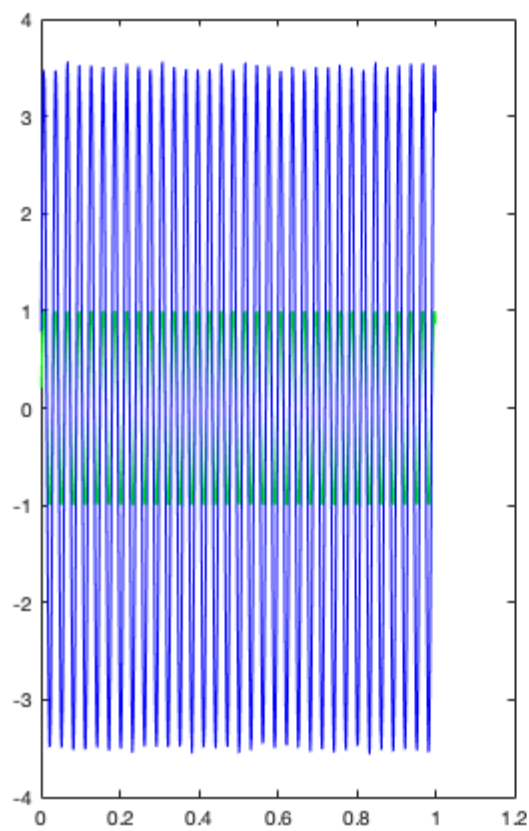
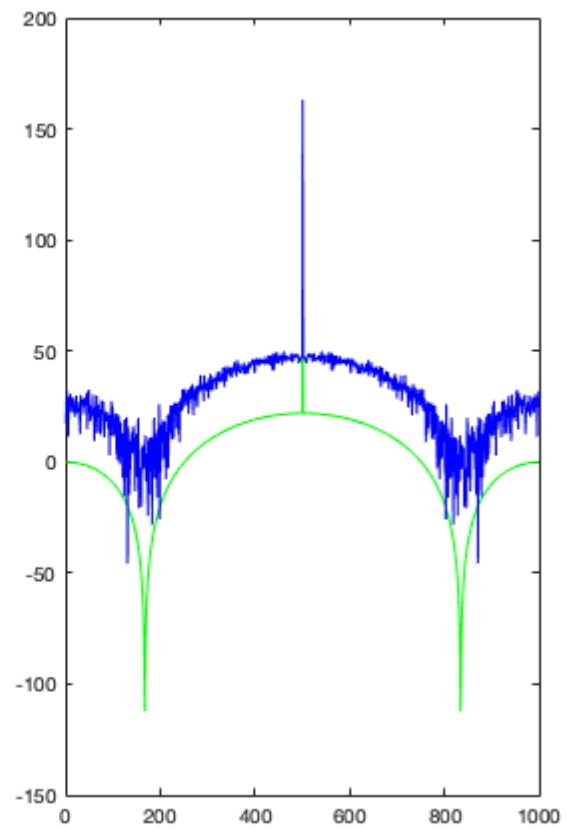
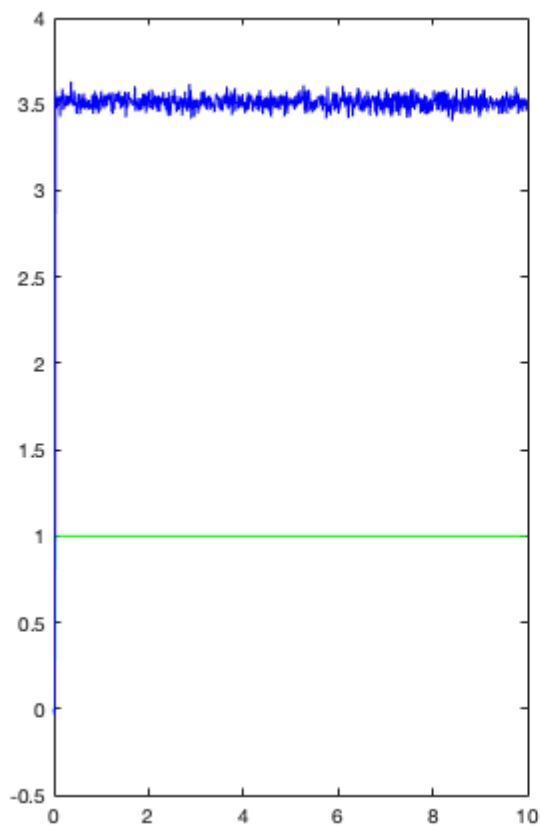
0  
0  
0  
1.0000  
0  
0  
0  
0

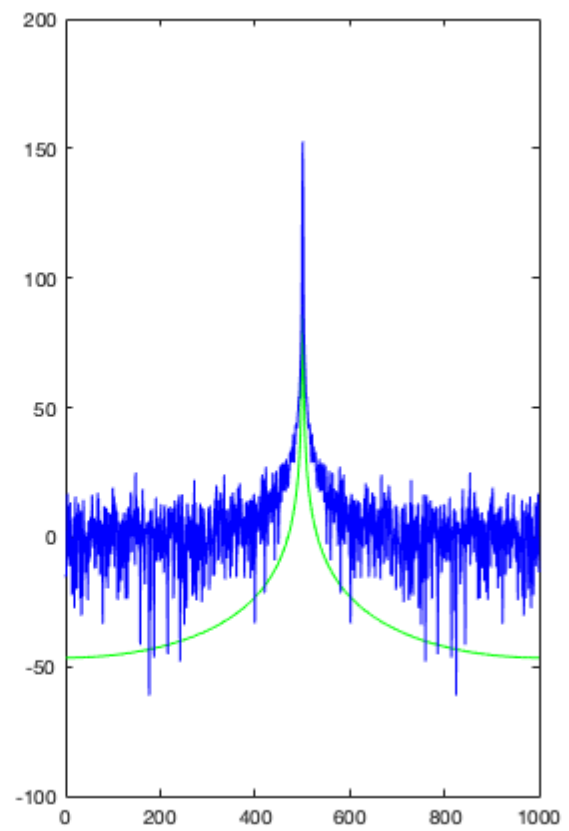
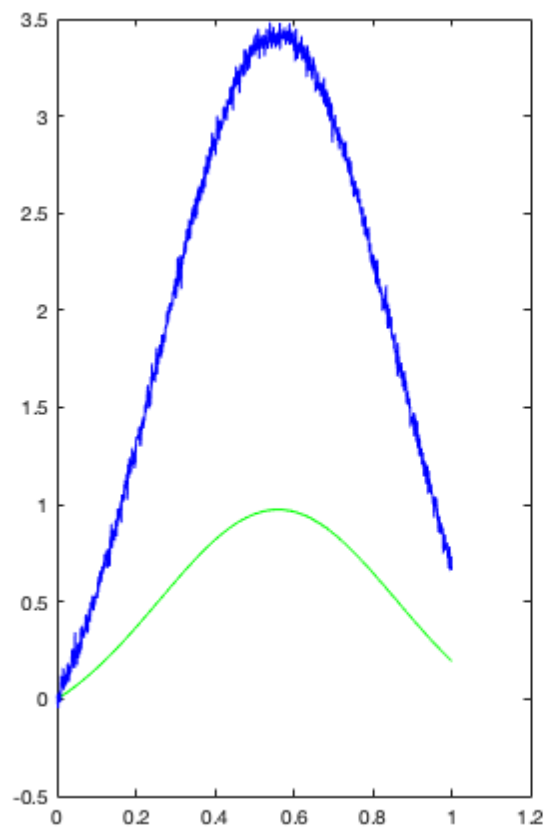




## Different capacitor values

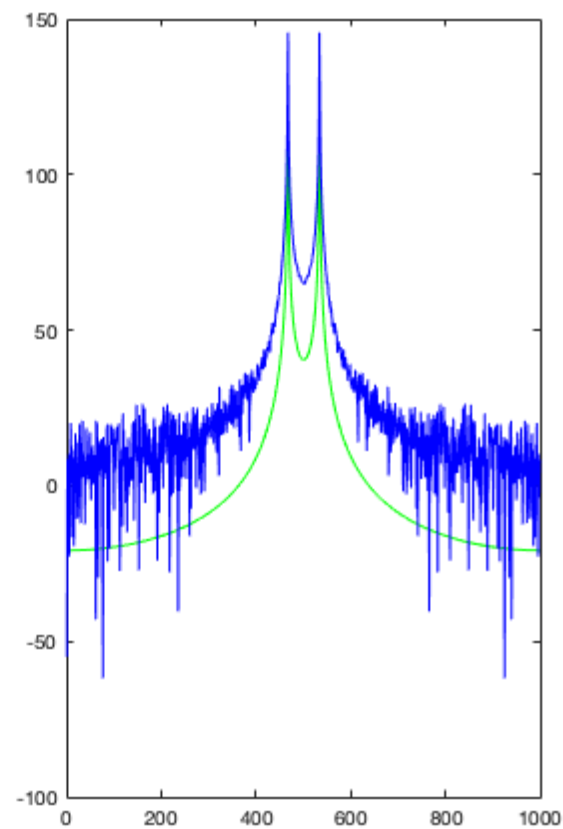
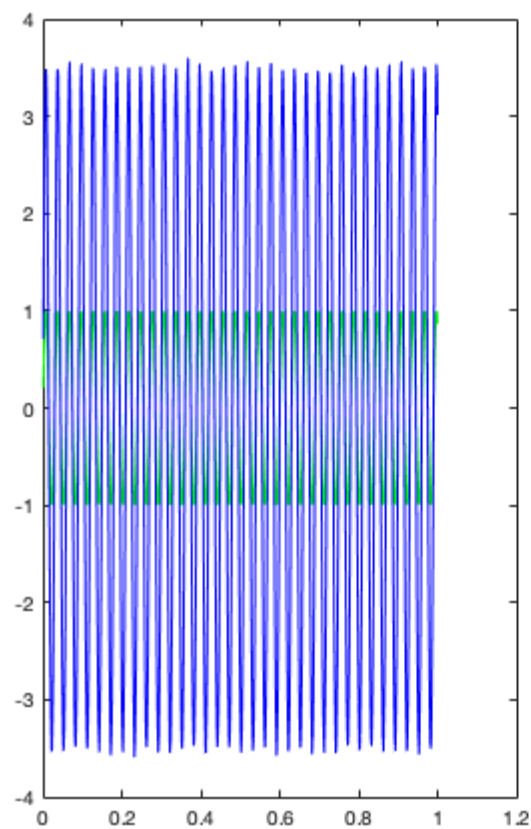
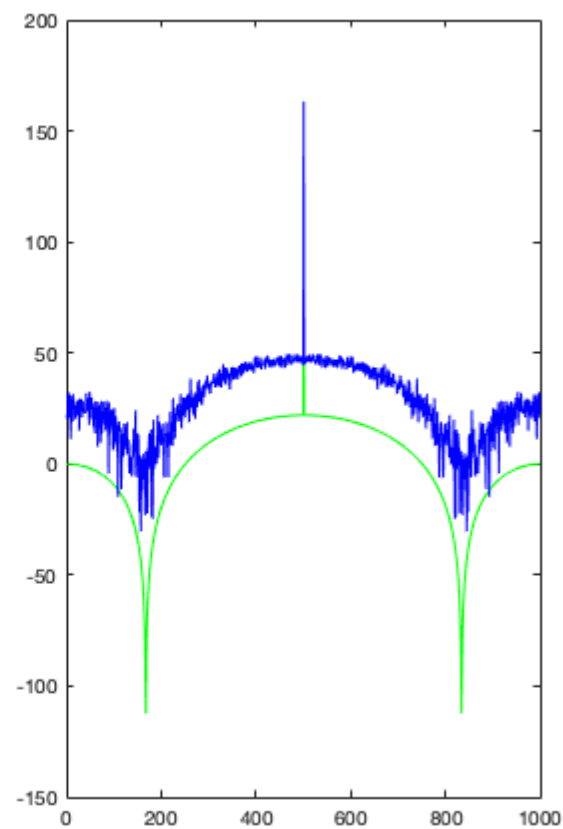
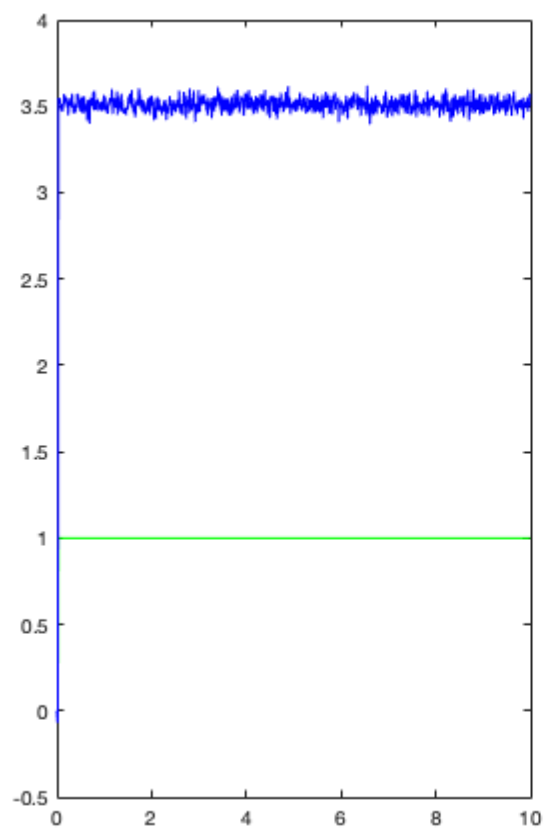
Cn1 ( )

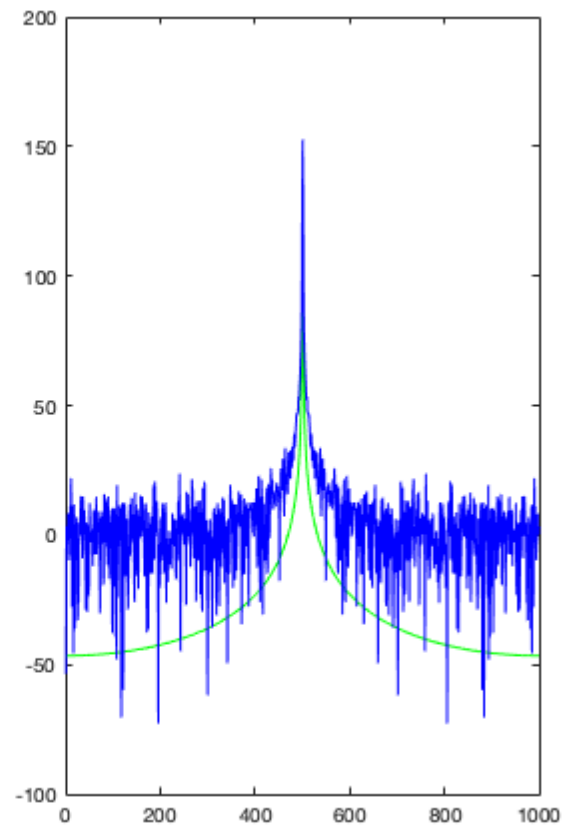
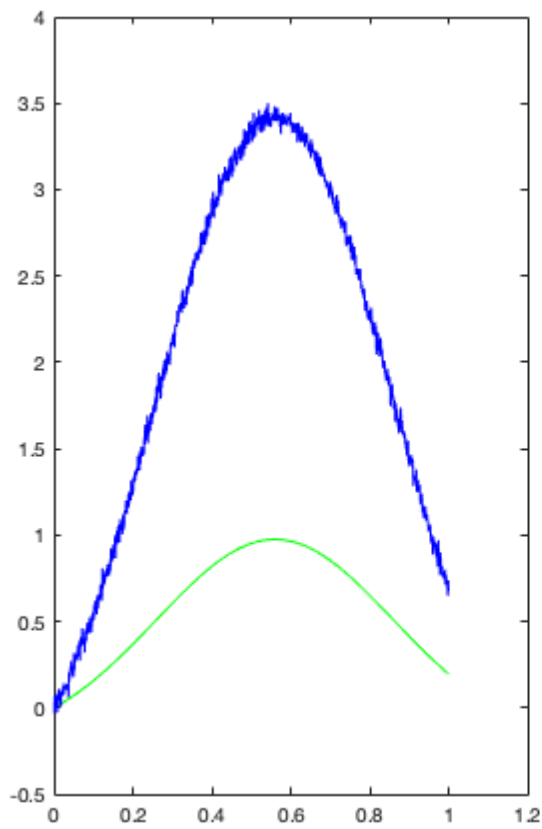




## Different capacitor values

Cn2 ( )

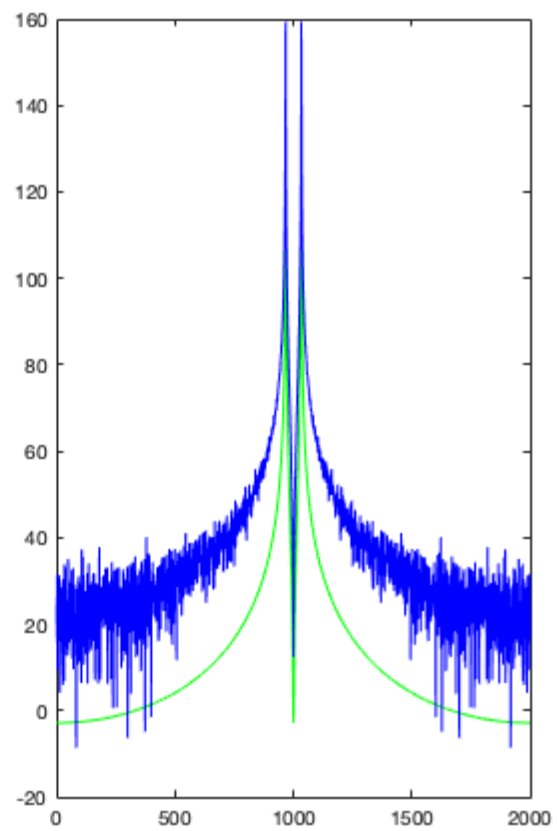
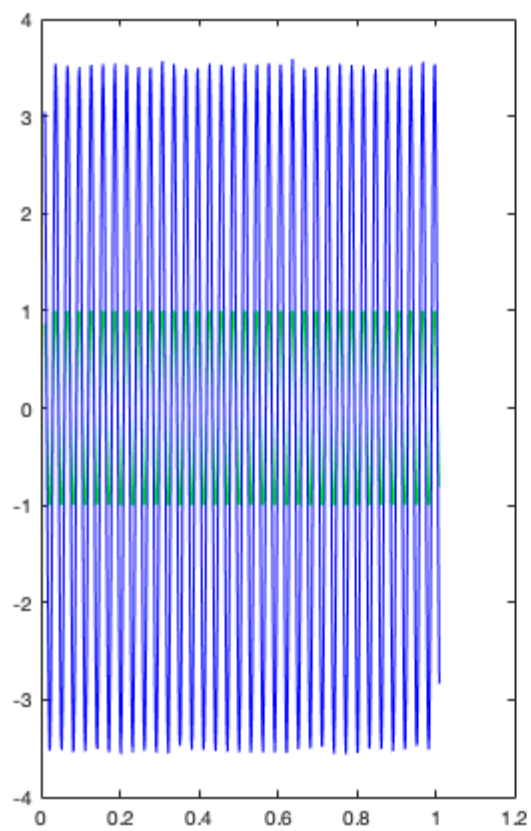
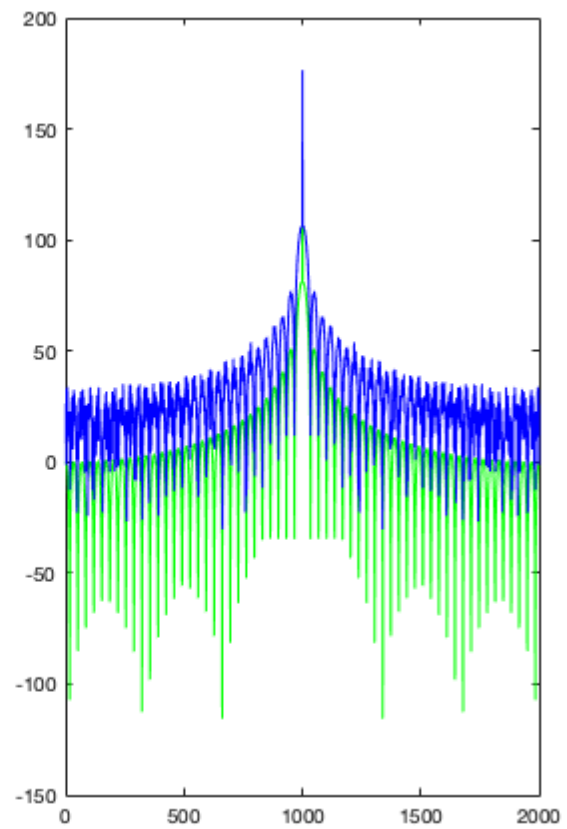
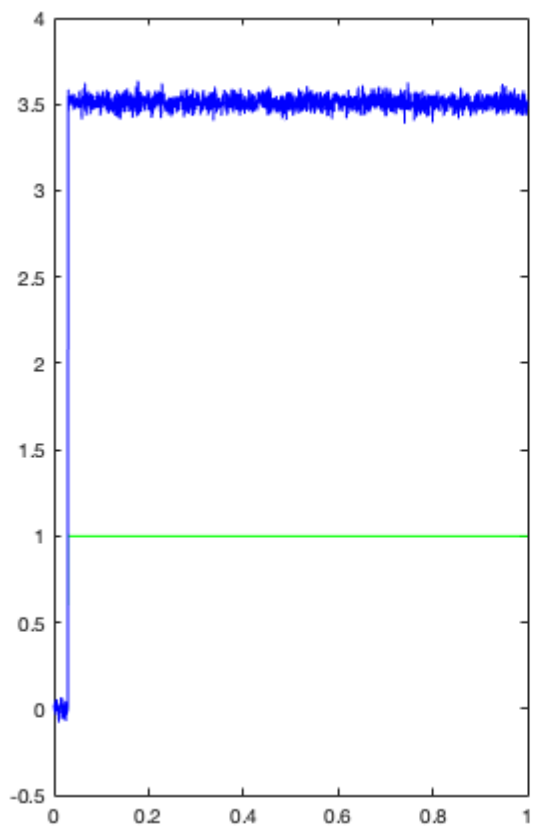


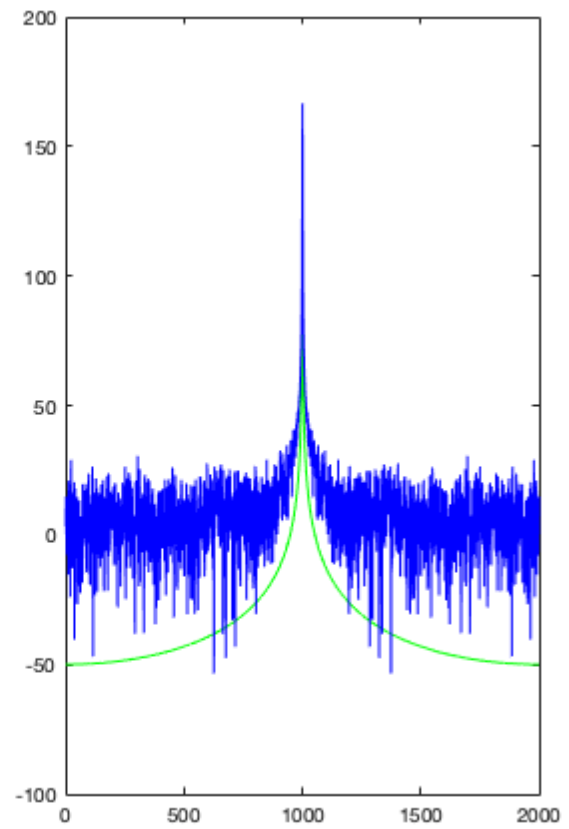
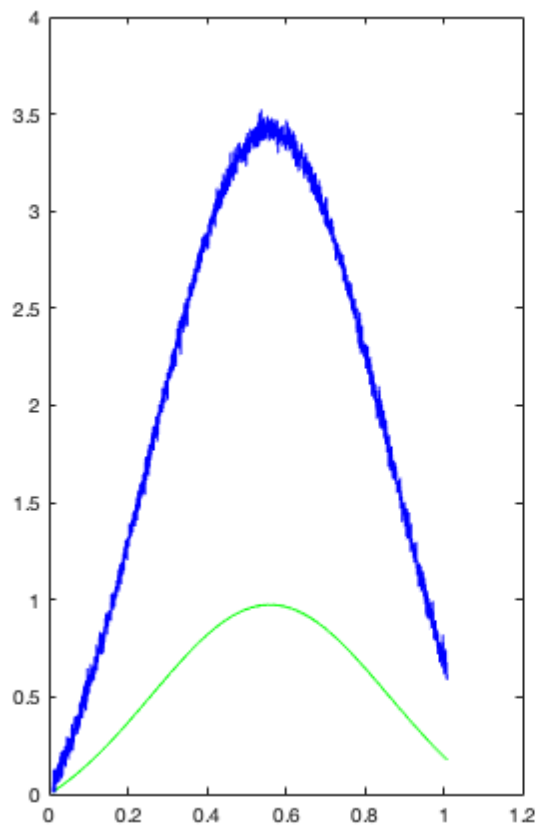


## Different time steps

```
time1()
```

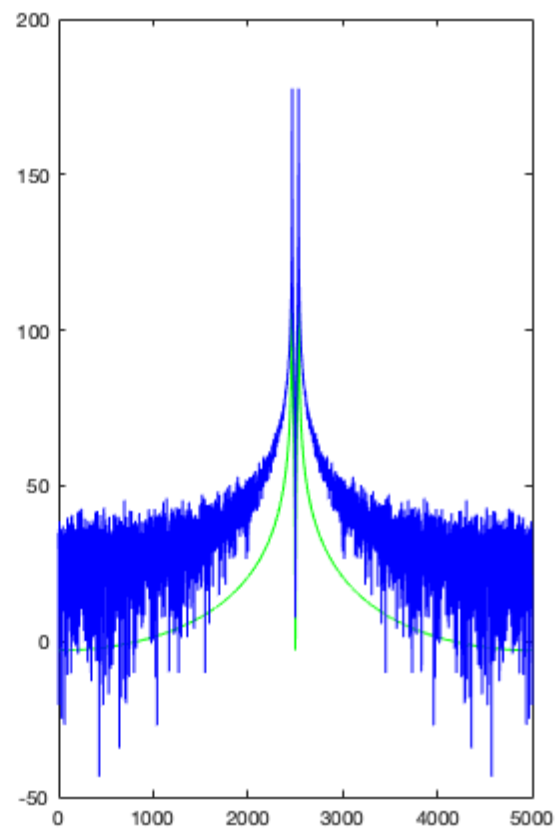
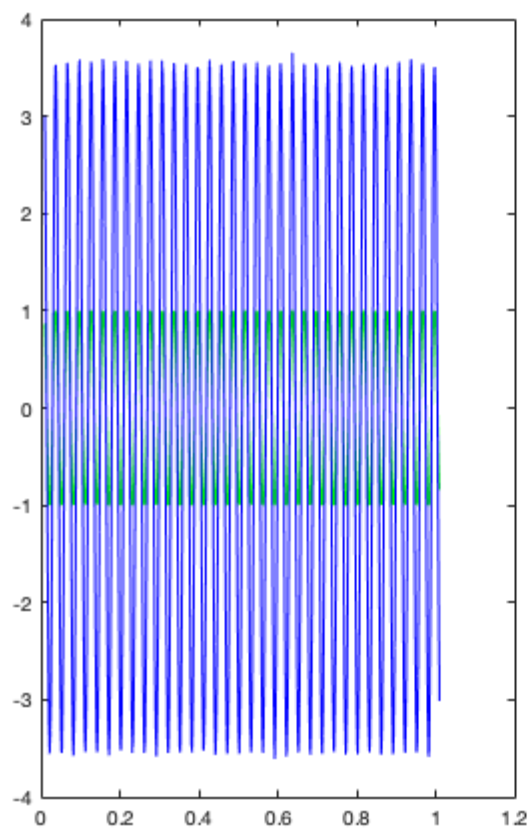
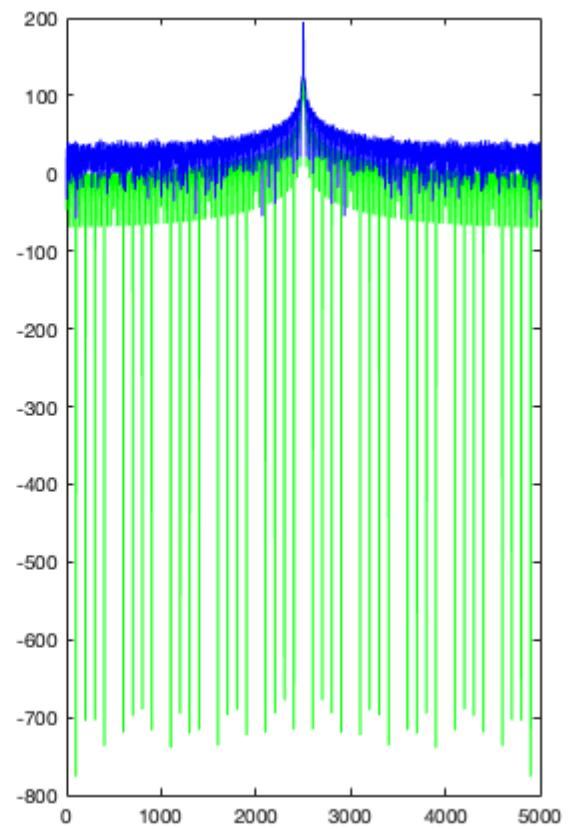
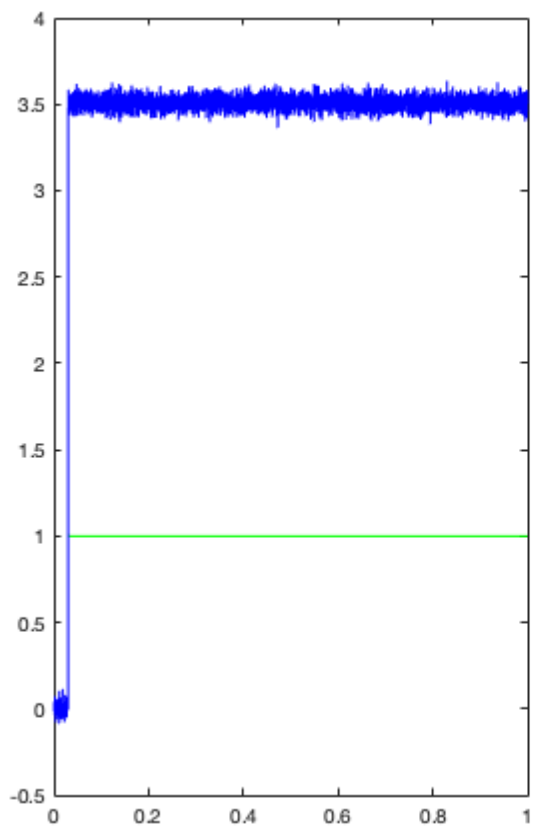


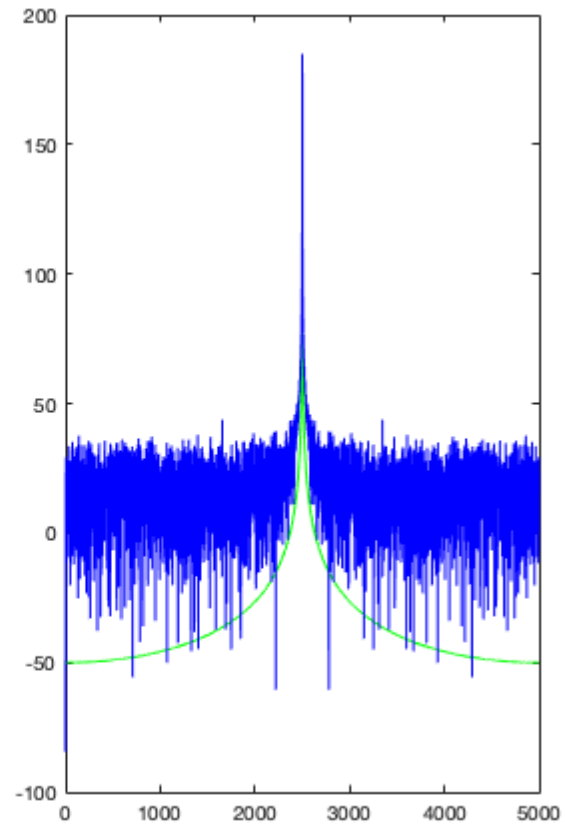
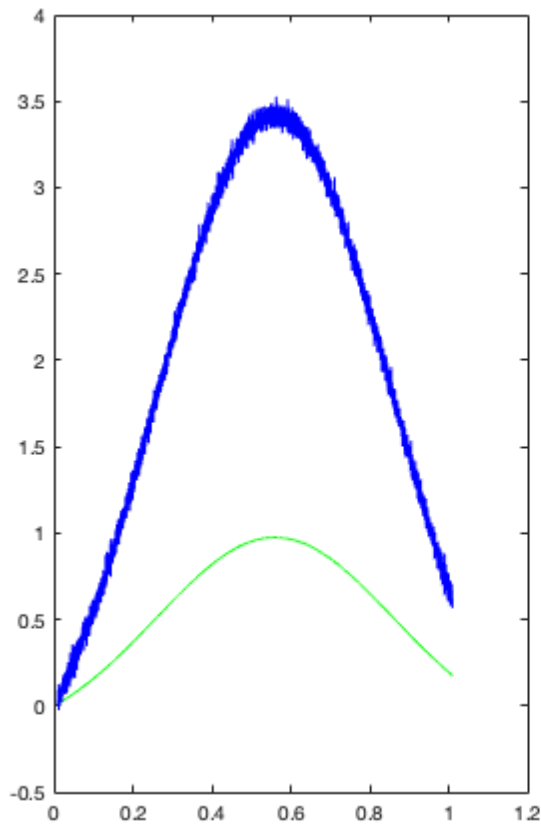




## Different time steps

```
time2()
```





### Part 3

So now what is happening is there is no longer a linear input being added. This does complicate things. When looking at the formula  $C \cdot dv/dt + GV = F$  this will not be sufficient to simulate this circuit. So what needs to be done is by using this new formula  $C \cdot dv/dt + GV + B(V) = F$ . This new formula has the input  $B(V)$  which accounts and deals with the non-linear term. So the same process would take place in order to find the  $C$ ,  $G$ ,  $F$  matrix. But in our new formulas we must take into account the new non-linear term, by creating a  $B(V)$  matrix that is arranged in the order so that it fits properly in our simulation. Since this has been established, going back into the code to modify all our operations for when  $V$  is being calculated at the output and adding the  $B(V)$  term into the calculation. This would now function with the new non-linear term and produce a result incorporating the non-linear term.