EE_105_021_23W Lab 3

Daisy Rojas Garcia

TOTAL POINTS

98 / 100

QUESTION 1

4.1 30 pts

1.1 1.1 First Method **15 / 15**

✓ **- 0 pts** *Correct*

1.2 1.2 Second Method **15 / 15**

✓ **- 0 pts** *Correct*

QUESTION 2

4.2 45 pts

2.1 2.1: 4.2.1 **13 / 15**

✓ **- 0 pts** *Correct*

✓ **- 2 pts** *No discussion of convergence rate*

2.2 2.2: 4.2.2 **15 / 15**

✓ **- 0 pts** *Correct*

2.3 2.3: 4.2.3 **15 / 15**

✓ **- 0 pts** *Correct*

QUESTION 3

3 Prelab (points assigned based on Prelab completion prior to lab) **25 / 25**

✓ **- 0 pts** *All questions complete before lab*

PART 1

Methods 1 and 2

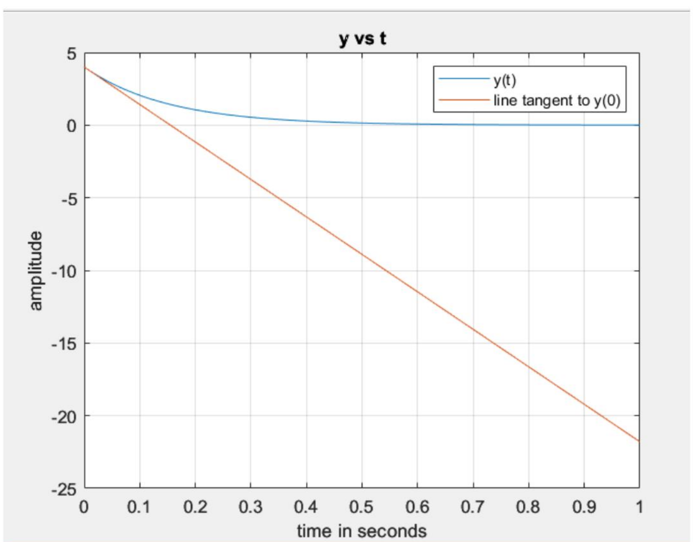
```
% Part1 TC estimation
%
figure

plot (t, y)
grid on
title('y vs t')
xlabel('time in seconds')
ylabel('amplitude')
hold on

%%method 1 y(tau) = .37y(0)
%y(0) = 4
%y(tau) = .37*4 = 1.4800
% by looking in the data, we see 1.4715 is the closest Y(tau) value, this is at
% t = .15 seconds so tau = 0.15s

%%method 2
%we will find the line tangent to y(0)
%in the form y = mx+b
%for us y = mt+b
%(y2-y1)/(x2-x1) = (3.7420-4)/(0.1) = -25.8
%y(0) = 4, so then
%y1 = -25.8t+4 , this is the line tangent to y(0)
y1 = -25.8*t + 4
plot(t,y1)
legend('y(t)','line tangent to y(0)')
```

The first method is to take y(0) and to multiply by 0.37 to get our y for our time constant. Above is the code and calculation in the comments. Note the .37 multiplication will give you the y, not the tau, for the tau you will need to find the x for which that y value corresponds to. For us, this was .1500



The second method is finding and graphing the line tangent to y(0). We use y mx+b, we take the first two points and use the equation above. This gives us the slope, then we plug into the mx+b equation. This results in a slope of -25.8. Next we find where the graph intercepts y = 0. For my graph there wasn't a point there so I estimated by calculating the difference between two points on each side .0 = 25.800+4, this resulted in -4/-25.8 = 0.1550. This is close to what we got when we did our first method.

1.1 1.1 First Method **15 / 15**

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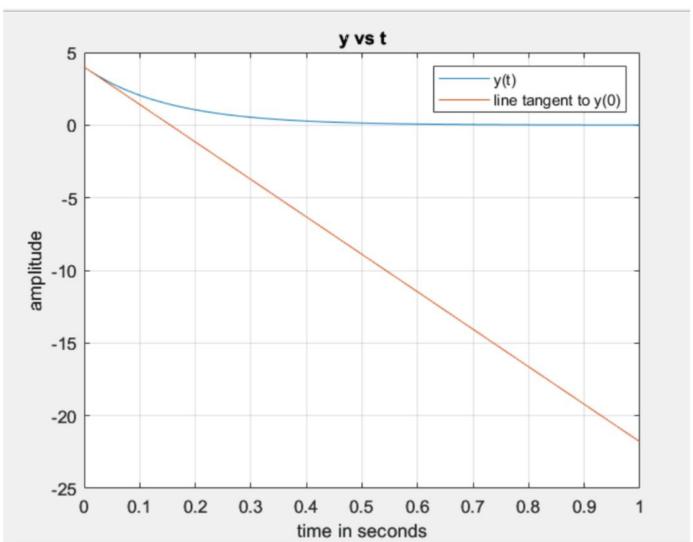

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1.2 1.2 Second Method **15 / 15**

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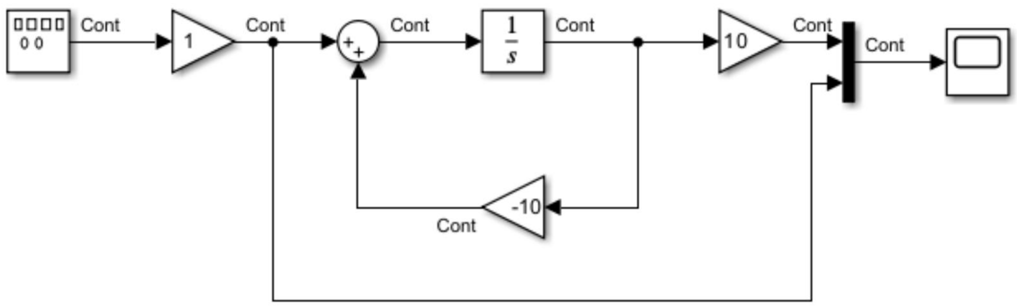
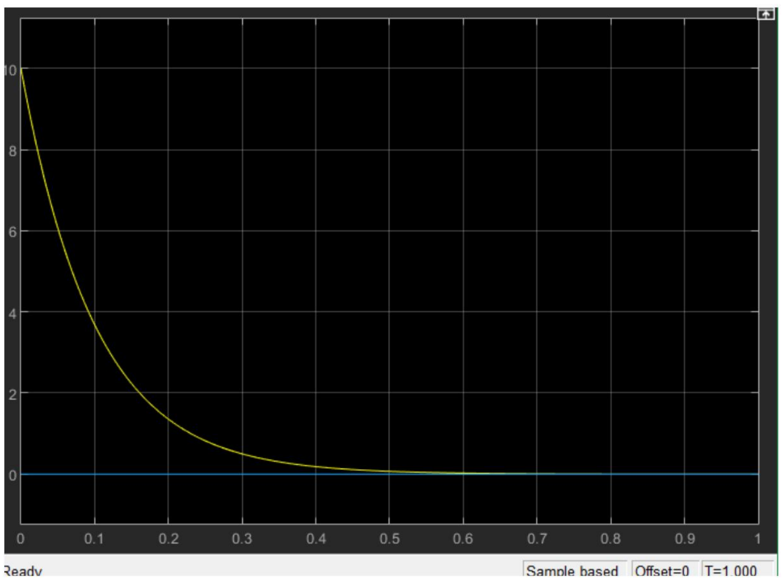
PART 2

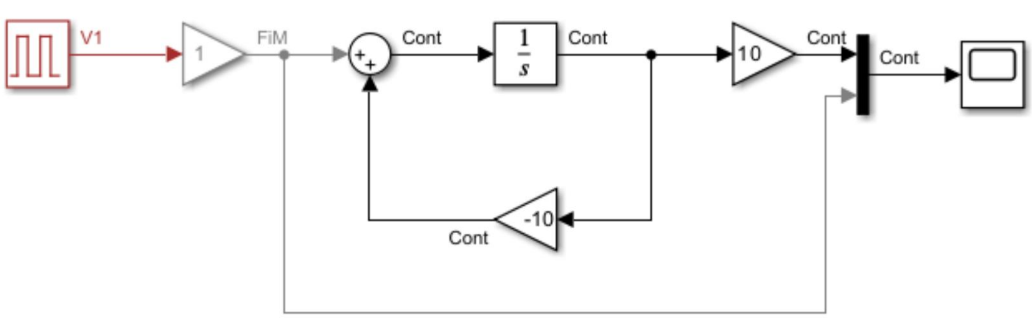




d)The units for the integrator are volts

e)Yellow line is y, and blue line is input u. This is the simulation for u = 0. As we see , our system goes to 0 as we approach infinity. This settles around 0.6

Unit step response



2.1 2.1: 4.2.1 **13 / 15**

✓ **- 0 pts** *Correct*

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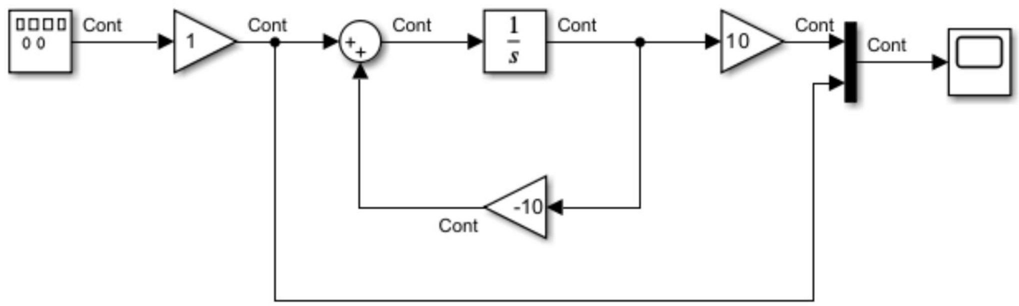
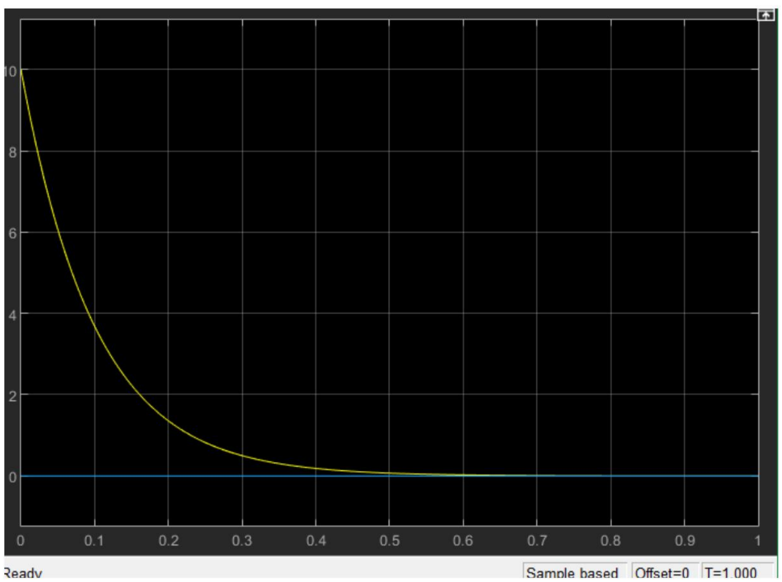
PART 2





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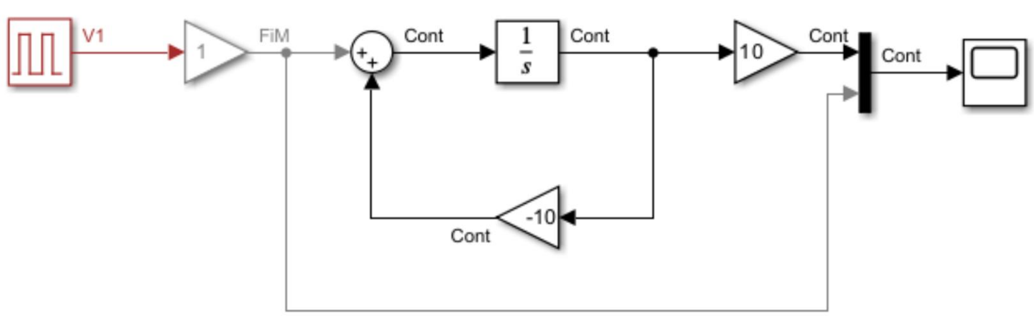
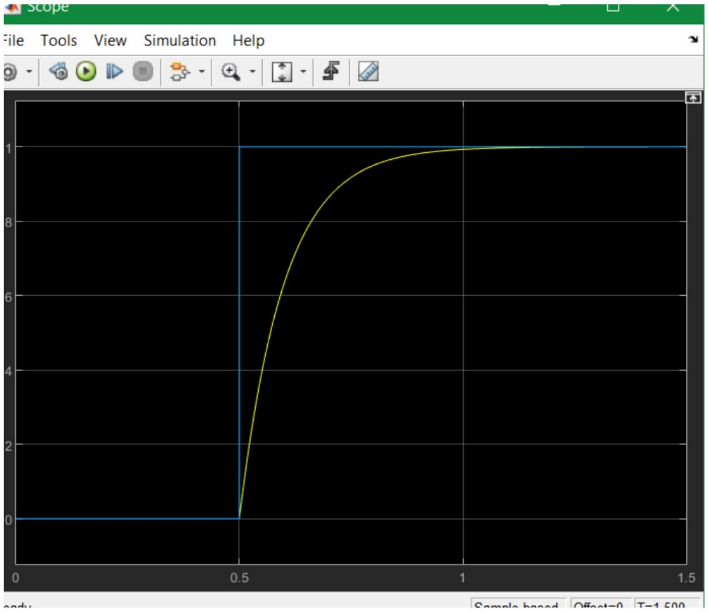
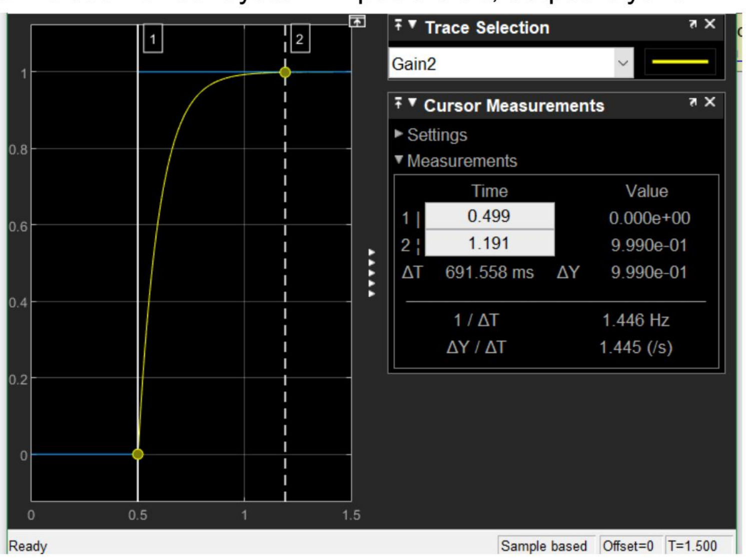


B



Simulation of our system. Input is blue, output is yellow.



Same simulation, now with time constant calculation.

a)20 TC = 2 seconds. In the lab it was specified to change the input from a pulse generator to a step generator.

c)Time to steady state is (1.191 - 0.499) = 0.6920s
This compares to the time constant 0.1 second by being about 7 times larger.

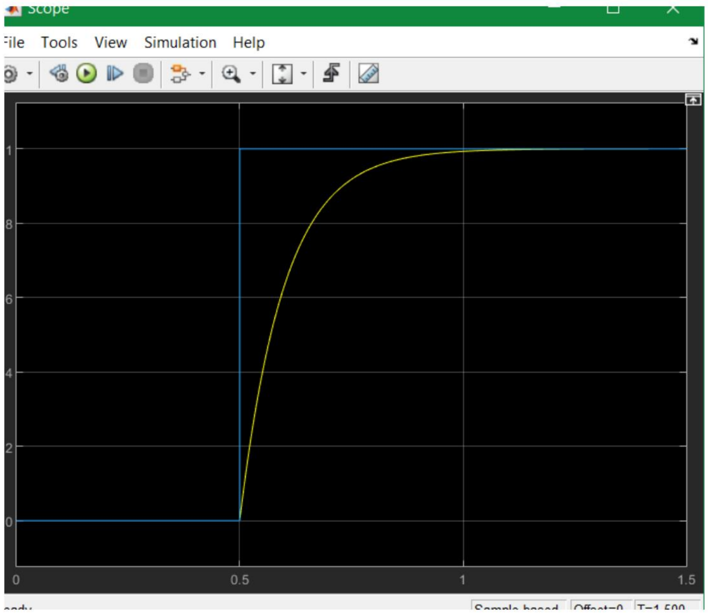
d)The steady state value of y is 1. This compares to the DC gain by matching our prediction of a Gain of 1, Gain = cb/a = 10/10 = 1.

3. Sinusoidal input

2.2 2.2: 4.2.2 **15 / 15**

✓ **- 0 pts** *Correct*

B



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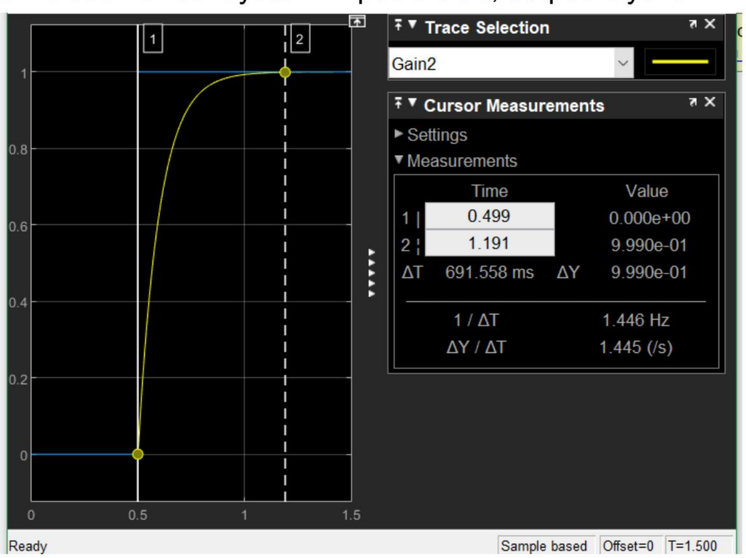

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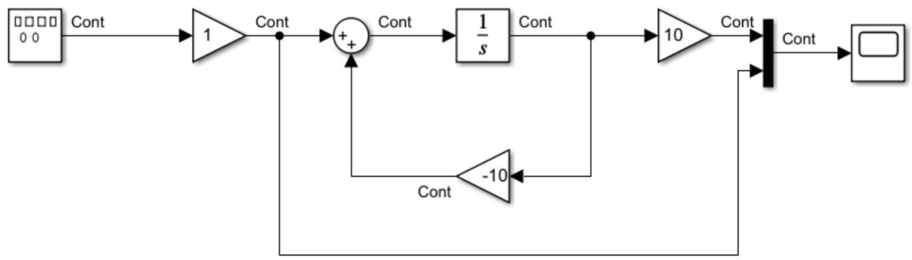


Simulations of 3.

(d) ω = 0.00, 0.01,0.10, 1.00, 10.00, and 100.00 rad/sec.

Simulation did not allow w = 0.00, it stated that the input must be positive.

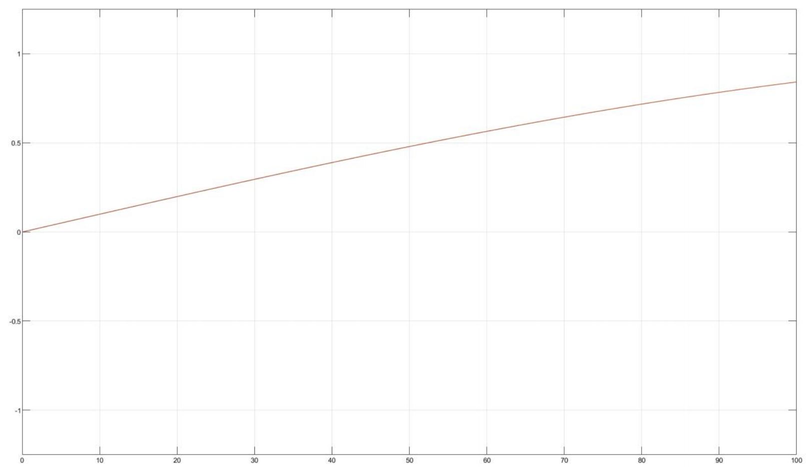
Frequency in ω	0.0	0.01	0.1	1	10	100
Magnitude y	n/a	1	1* very close to 1	9.05x10^-1	7.07x10^-1	9.94x10^-2
Difference in magnitude	n/a	1.27x10^-7	4.99x10^-5	0.095	0.293	0.9006
Phase difference	n/a	0.057 degrees	0.57 degrees	5.75 degrees	53.03	81.29
period		626s	62.7s	6.26s	.707s	0.0626s
Delta T		100.0ms	101ms	102.32ms	104.84ms	14.5ms

For w = 0.01, the sine waves do not complete a full cycle so the magnitudes are taken at the highest point shown, t =100.we increase time to get a period of 628 seconds. We use the following equation to calculate phase difference.

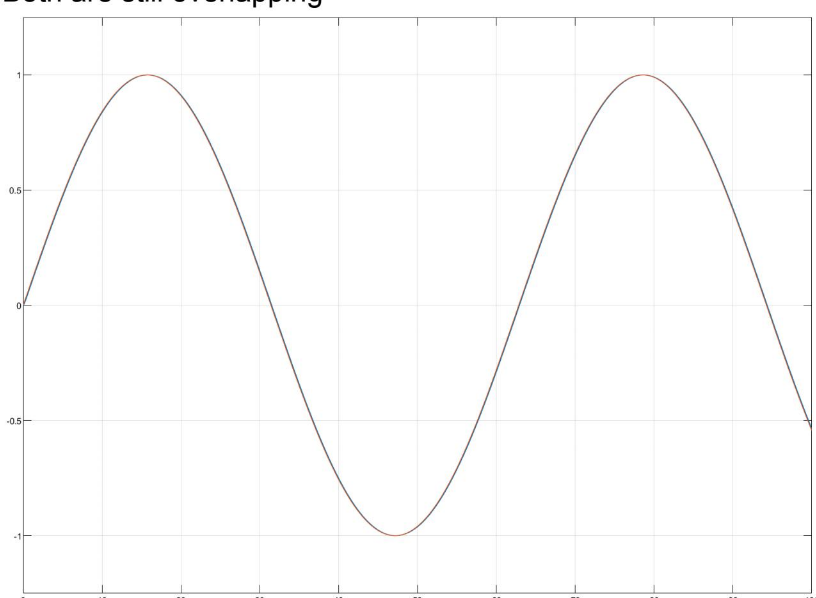
(Delta T * 360)/period

W = 0.01

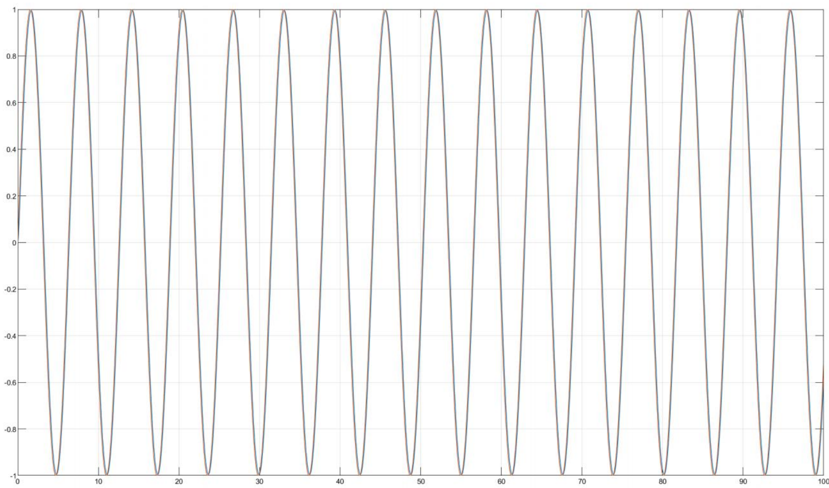
Simulation for w = 0.01. Graph of our output and input. Both seem to overlap.



Simulation for w = 0.1
Both are still overlapping

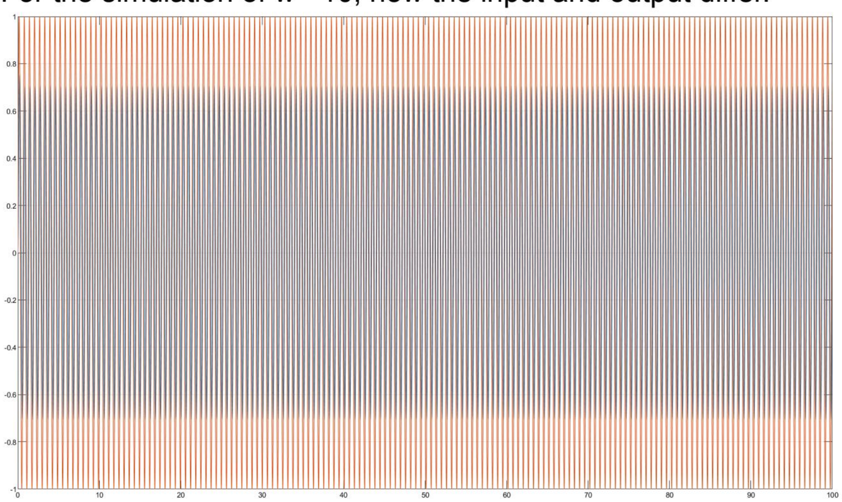


w=1
Simulation for w =1. Graph is still overlapping input and output.

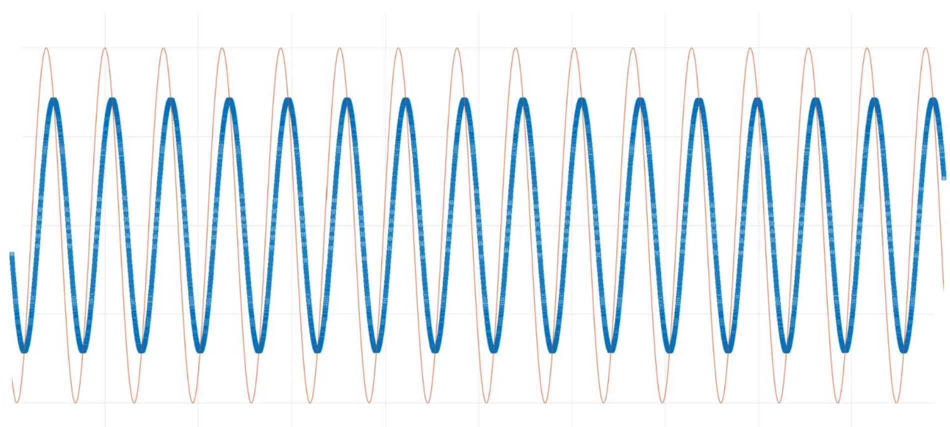


w=10

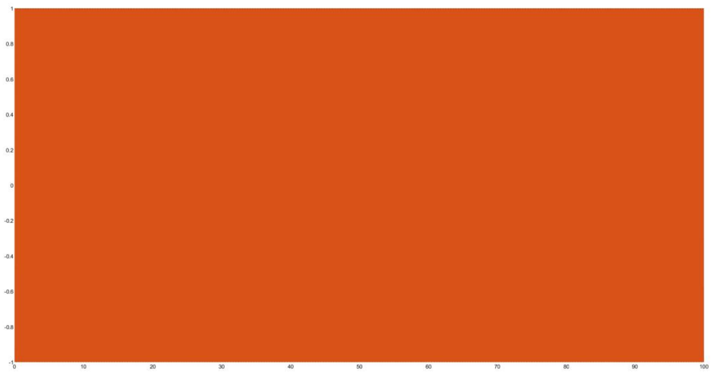
For the simulation of w= 10, now the input and output differ.



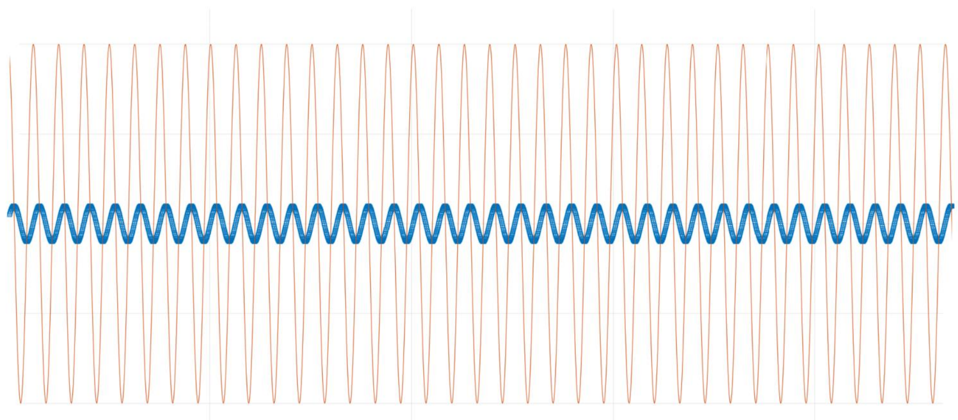
This is the simulation with the original scaling, this graph is too dense to tell what is really happening.



This is the same graph, now stretched horizontally so we can see the distinction between the input and the output. The output is blue and now smaller than the w=100



This simulation is for w = 100. And too dense to tell what is happening. As you can see it is solid.



This is the same simulation, but like previously, it is stretched to see the input and output. The output now has been greatly reduced.

e)As we can see from our table and our predictions, the magnitudes match up. Until w= 1, they are fairly close to 1. Then at w = 10, the magnitude is reduced, and as we increase to w= 100 it is reduced even more. The magnitude and phase difference increase as we increase omega,meaning that the gap between both sine waves increases.

2.3 2.3: 4.2.3 **15 / 15**

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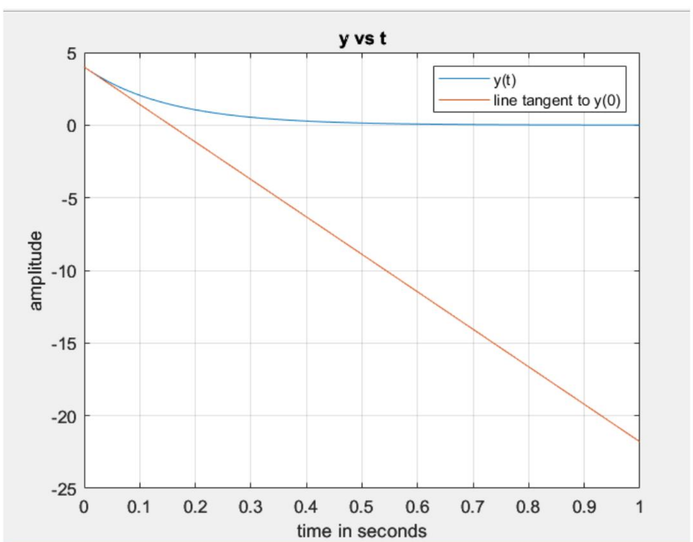

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