

IEE EVALUATION 10 CLASS ASSIGNMENT (BATCH A TEAM 11)

TEAM MEMBERS

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Q1

- Create MATLAB codes to implement a gain-tunable inverting amplifier which is taking the following functions as input.

- Sinusoidal, Square, Triangular, Constant DC

LOGIC DIAGRAM

Inverting amplifier

$A_v = \text{GAIN}$

$$I_1 = \frac{V_{in} - V_A}{R_1} = \frac{V_{in} - 0}{R_1}$$

$$I_1 = \frac{V_{in}}{R_1}$$

$$I_f = \frac{V_A - V_o}{R_f} = \frac{0 - V_o}{R_f}$$

$$I_f = -\frac{V_o}{R_f}$$

$$I_1 = I_f$$

$$\frac{V_{in}}{R_1} = -\frac{V_o}{R_f}$$

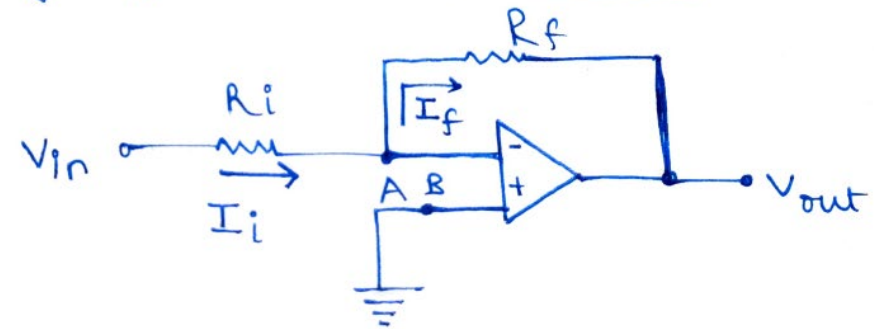
$$V_o = -\left(\frac{R_f}{R_1}\right)V_{in}$$

$$A_v = -\frac{R_f}{R_1}$$

IEE - E10 - BATCHA - TEAM - II

Chart

Inverting Amp (AC Source) (DC Source)



So basically input voltage source is going to be different.

for AC source V_{in} 

for DC source V_{in} 

A-MATLAB CODE

MATLAB R2021b - academic use

HOME PLOTS APPS EDITOR PUBLISH VIEW

New Open Save Compare Print Go To Find Refactor Run Section Run and Advance Run Step Stop

FILE NAVIGATE CODE ANALYZE SECTION RUN

Workspace

Name	Value
f	10
Rf	50
Ri	10
t	[0.0, 1000.0, 2000.0, ...]
vin	[500, 500, 500, 500, ...]
vo	100
vout	[-2500, -2500, -2500, ...]

Editor - C:\Users\HP\Desktop\IEE_Q1_A.m

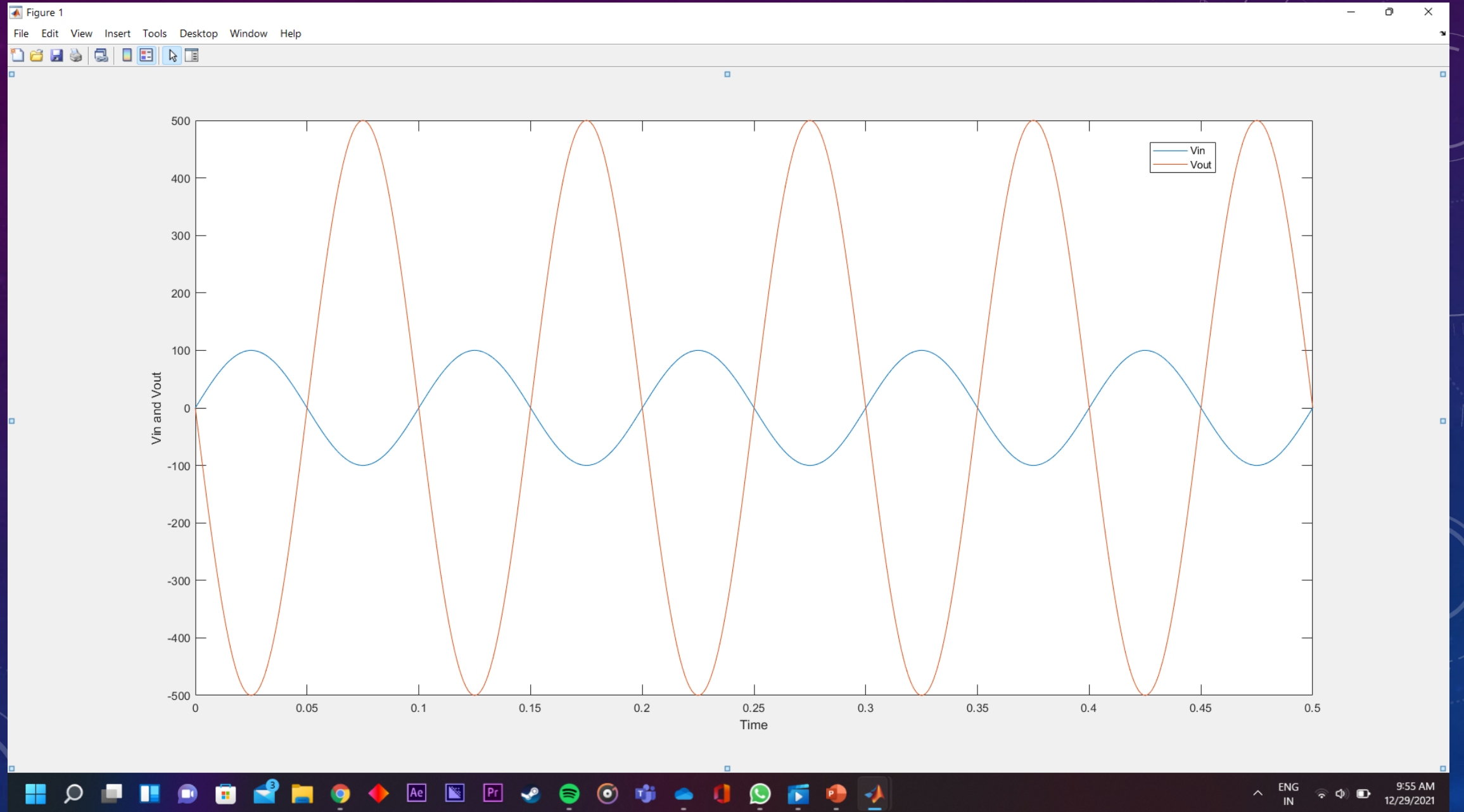
```
1 Rf = 50;  
2 Ri = 10;  
3 t = 0:0.001:0.50;  
4 f = 10;  
5 vo = 100;  
6 vin = (vo)*(sin(2*pi*f*t));  
7 vout = -(Rf/Ri).*vin;  
8 plot(t,vin)  
9 hold on  
10 plot(t,vout)
```

Command Window

```
>> IEE_Q1_D  
fx>> |
```

Windows Taskbar: 9:52 AM 12/29/2021

A-GRAPH



B-MATLAB CODE

MATLAB R2021b - academic use

HOME PLOTS APPS EDITOR PUBLISH VIEW

FILE NAVIGATE CODE ANALYZE SECTION RUN

Workspace

Name	Value
f	10
Rf	50
Ri	10
t	1x501 double
vin	1x501 double
vo	100
vout	1x501 double

Editor - C:\Users\HP\Desktop\IEE_Q1_B.m

```
1 Rf = 50;  
2 Ri = 10;  
3 t = 0:0.1:50;  
4 vin = square(t);  
5 vout = -(Rf/Ri).*vin;  
6 plot(t,vin)  
7 hold on  
8 plot(t,vout)
```

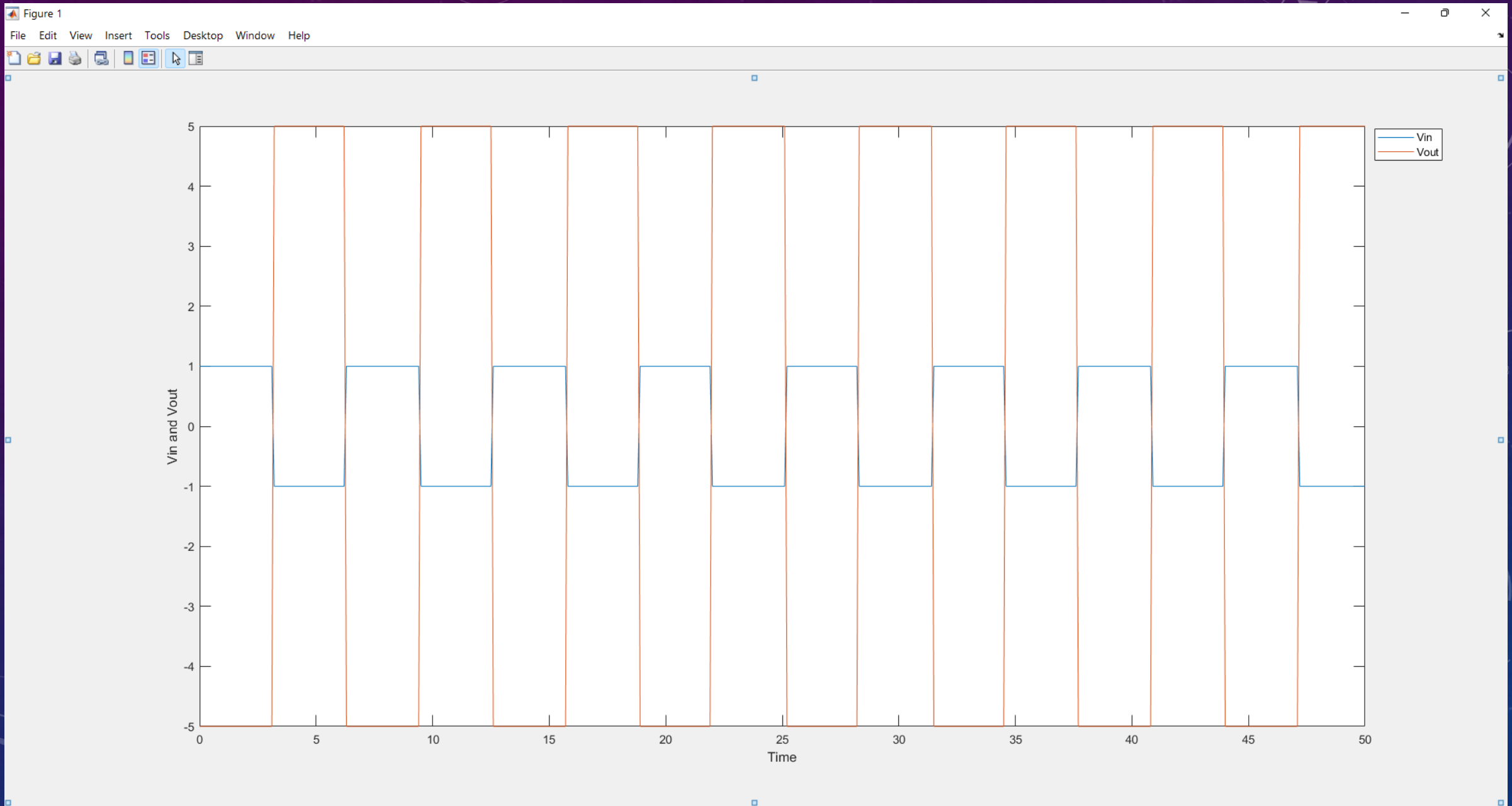
Command Window

```
>> IEE_Q1_B  
fx >>
```

Zoom: 100% UTF-8 CRLF script Ln 8 Col 13

10:02 AM 12/29/2021

B-GRAPH



C-MATLAB CODE

MATLAB R2021b - academic use

HOME PLOTS APPS EDITOR PUBLISH VIEW

FILE NAVIGATE CODE ANALYZE SECTION RUN

Workspace

Name	Value
f	10
Rf	50
Ri	10
t	1x501 double
vin	1x501 double
vo	100
vout	1x501 double

Editor - C:\Users\HP\Desktop\IEE_Q1_C.m

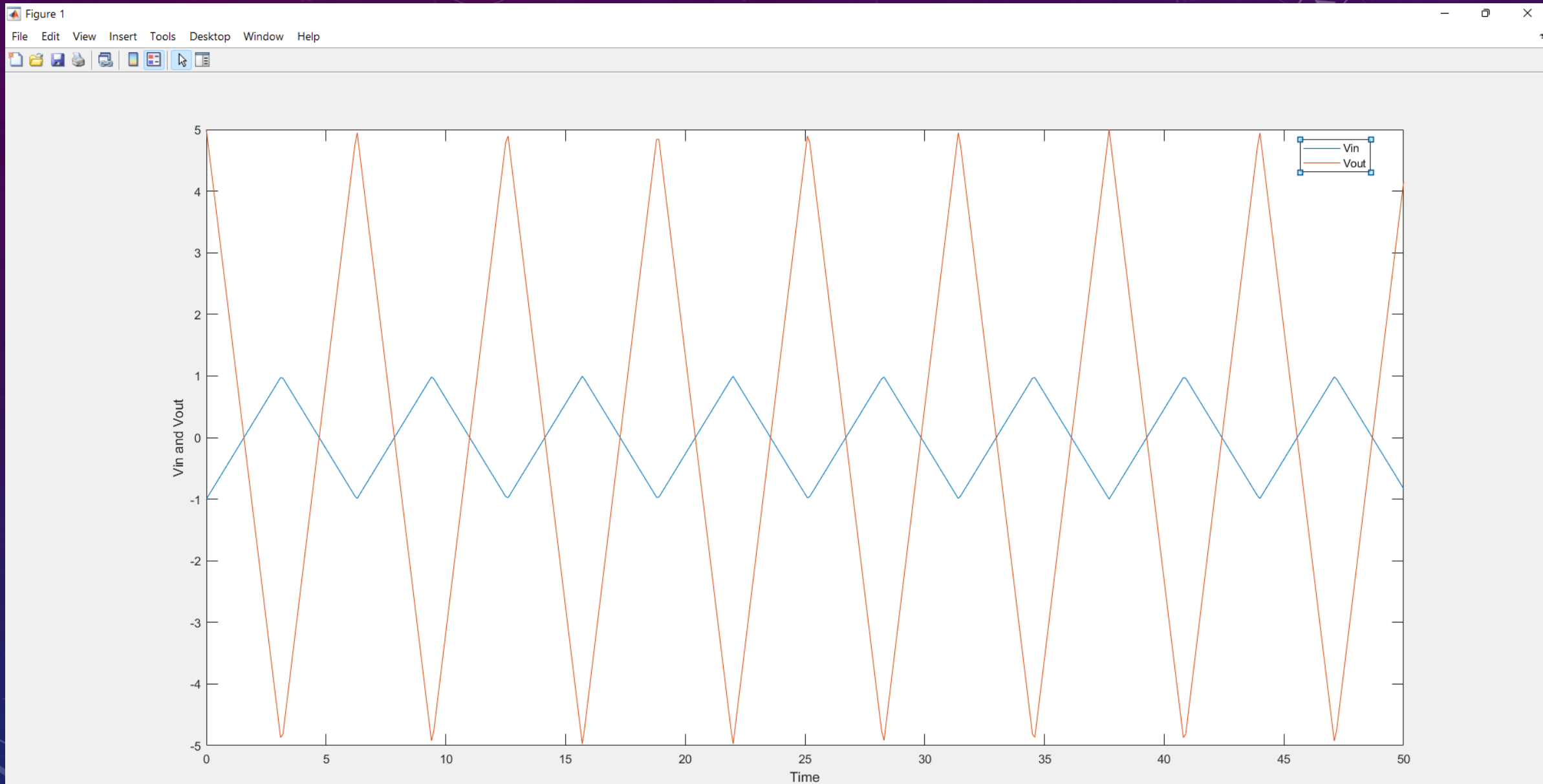
```
1 Rf = 50;  
2 Ri = 10;  
3 t = 0:0.1:50;  
4 vin = sawtooth(t,0.5);  
5 vout = -(Rf/Ri).*vin;  
6 plot(t,vin)  
7 hold on  
8 plot(t,vout)
```

Command Window

```
f>> |
```

Windows Taskbar: 10:05 AM 12/29/2021

C-GRAPH



D-MATLAB CODE

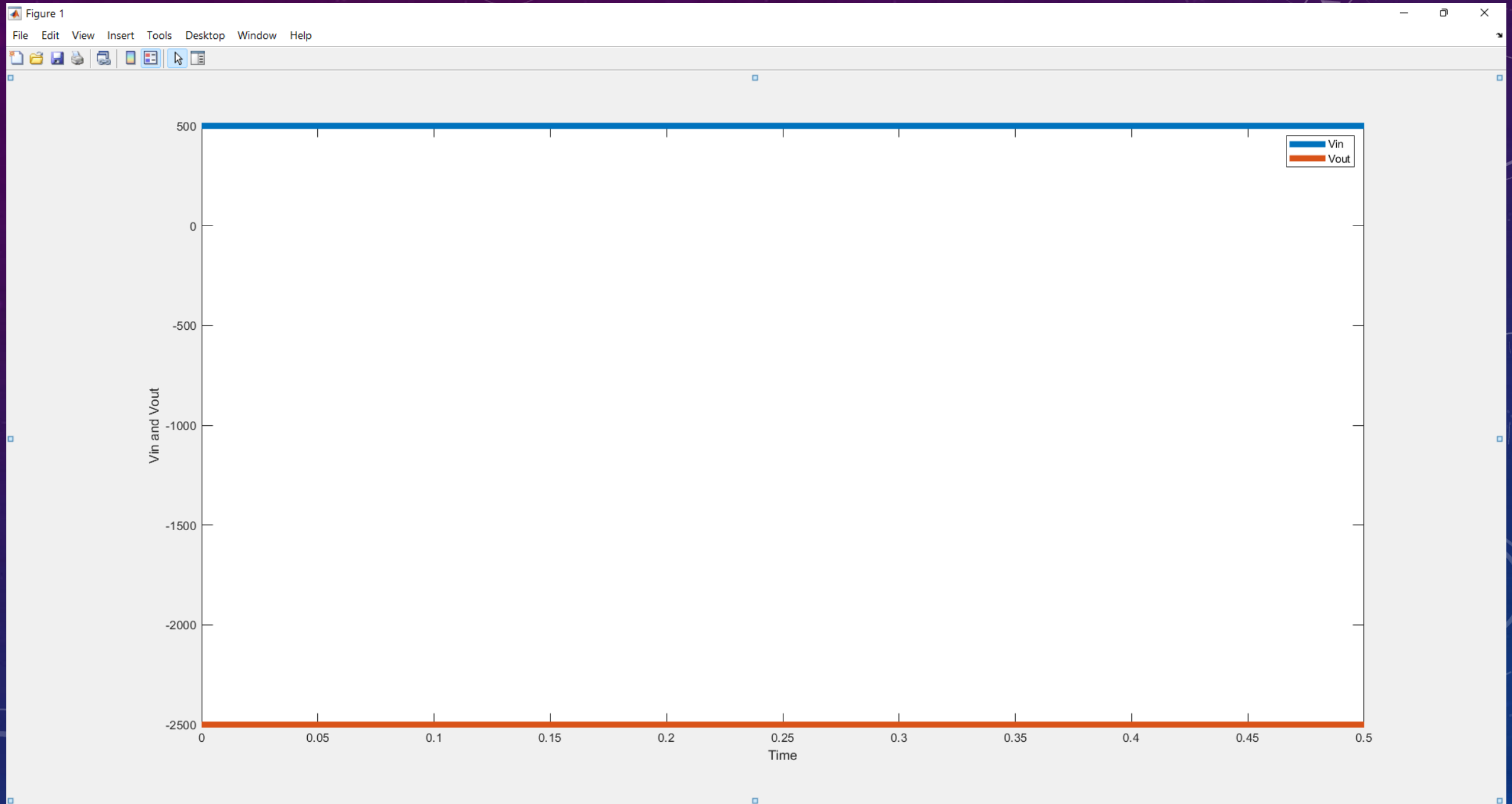
The image shows the MATLAB R2021b interface with the following components:

- Toolbar:** Includes tabs for HOME, PLOTS, APPS, EDITOR, PUBLISH, and VIEW. The EDITOR tab is active, showing icons for file operations (New, Open, Save, Print), navigation (Go To, Find, Bookmark), code editing (Refactor, Analyze), and execution (Run, Step, Stop).
- Workspace:** A table on the left showing the current workspace variables:

Name	Value
f	10
Rf	50
Ri	10
t	[0.0, 1000.0, 2000.0, ...]
vin	[500, 500, 500, 500, ...]
vo	100
vout	[-2500, -2500, -2500, ...]
- Editor:** The main window displays a script named 'IEE_Q1_D.m' with the following code:

```
1 Rf = 50;  
2 Ri = 10;  
3 t = 0:0.1:0.50;  
4 vin = (ones(size(t))*500) ; %We have assumed that a constant DC voltage  
5 vout = -(Rf/Ri).*vin; %is supplied whose value is 500 and using  
6 plot(t,vin,'linewidth',5) %that value we get output voltage  
7 hold on  
8 plot(t,vout,'linewidth',5)
```
- Command Window:** The bottom window shows the MATLAB prompt 'fx >>'.
- Taskbar:** The Windows taskbar at the bottom shows various application icons and the system clock indicating 10:09 AM on 12/29/2021.

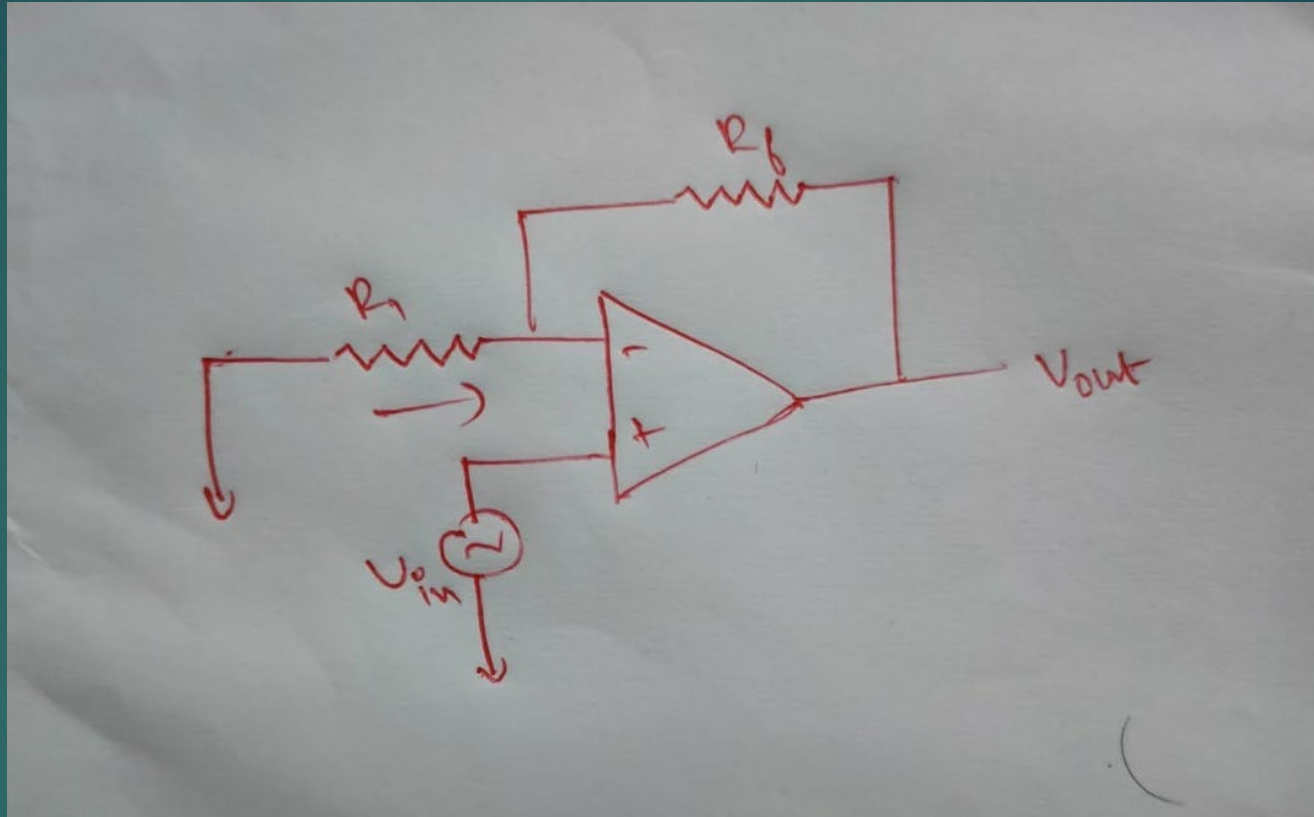
D-GRAPH

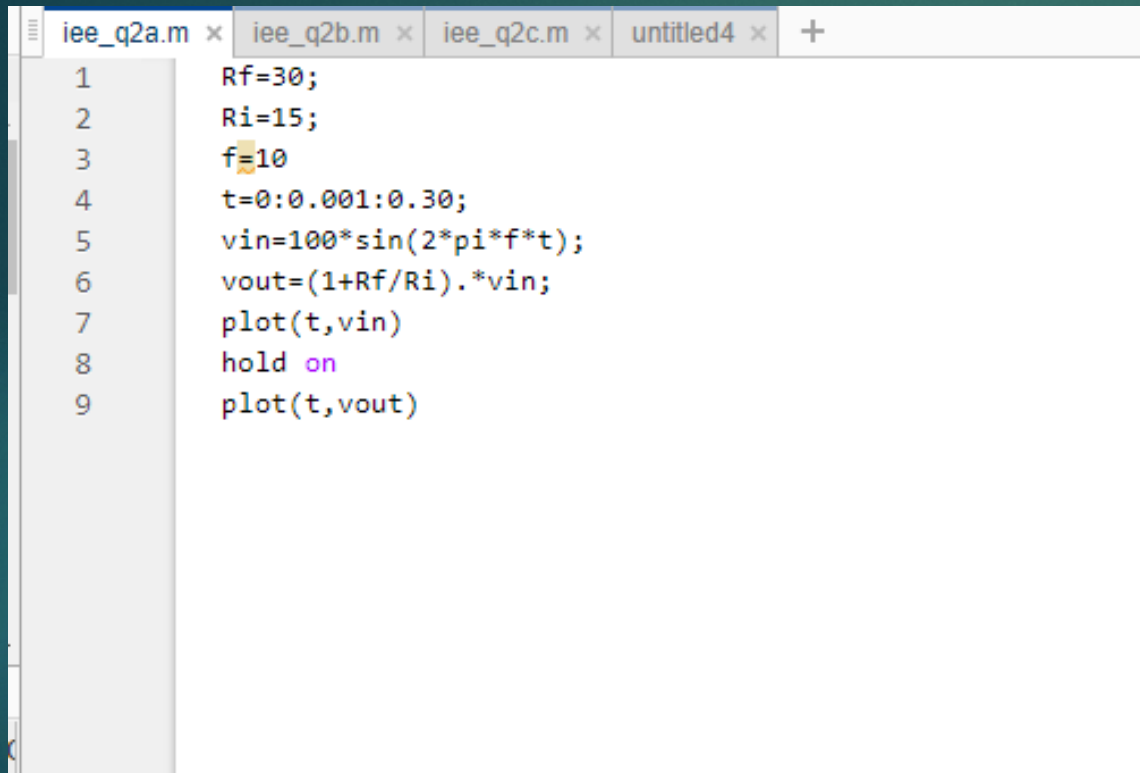


Q2

- Create MATLAB codes to implement a gain-tunable non-inverting amplifier which is taking the following functions as input.
- Sinusoidal, Square, Triangular, Constant DC

DIAGRAM

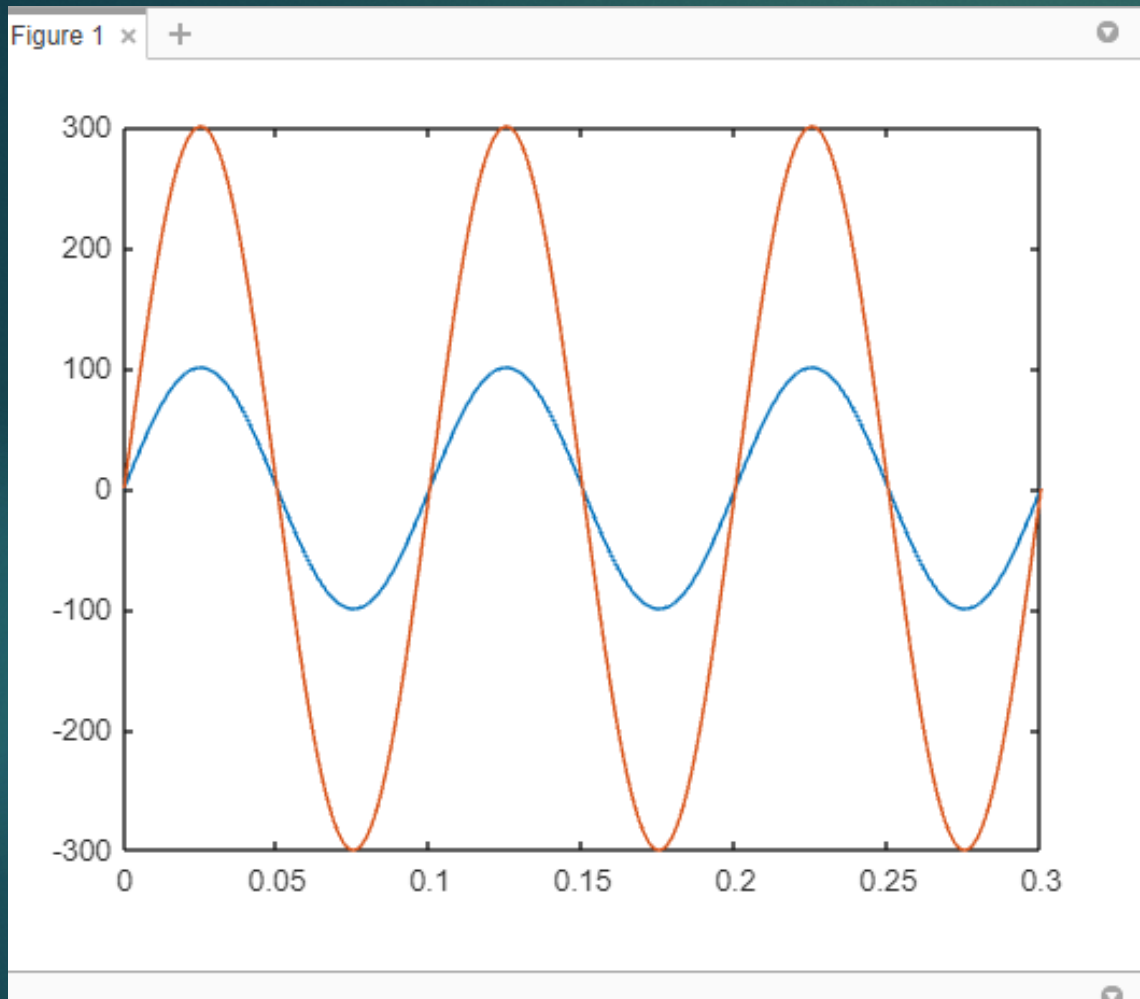




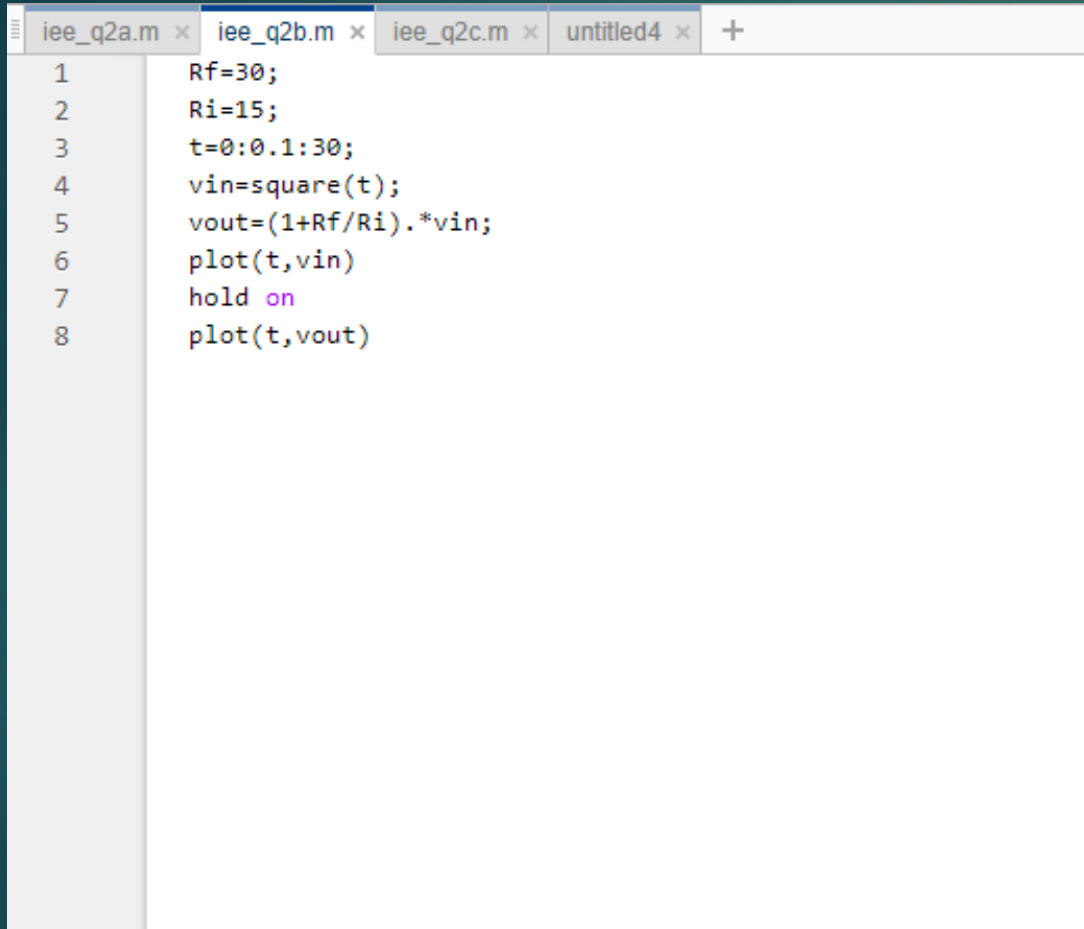
The image shows a MATLAB script editor window with four tabs: 'iee_q2a.m', 'iee_q2b.m', 'iee_q2c.m', and 'untitled4'. The 'iee_q2b.m' tab is active. The script contains the following code:

```
1 Rf=30;  
2 Ri=15;  
3 f=10  
4 t=0:0.001:0.30;  
5 vin=100*sin(2*pi*f*t);  
6 vout=(1+Rf/Ri).*vin;  
7 plot(t,vin)  
8 hold on  
9 plot(t,vout)
```

1) INPUT IS
SINUSOIDAL:
MATLAB
CODE;



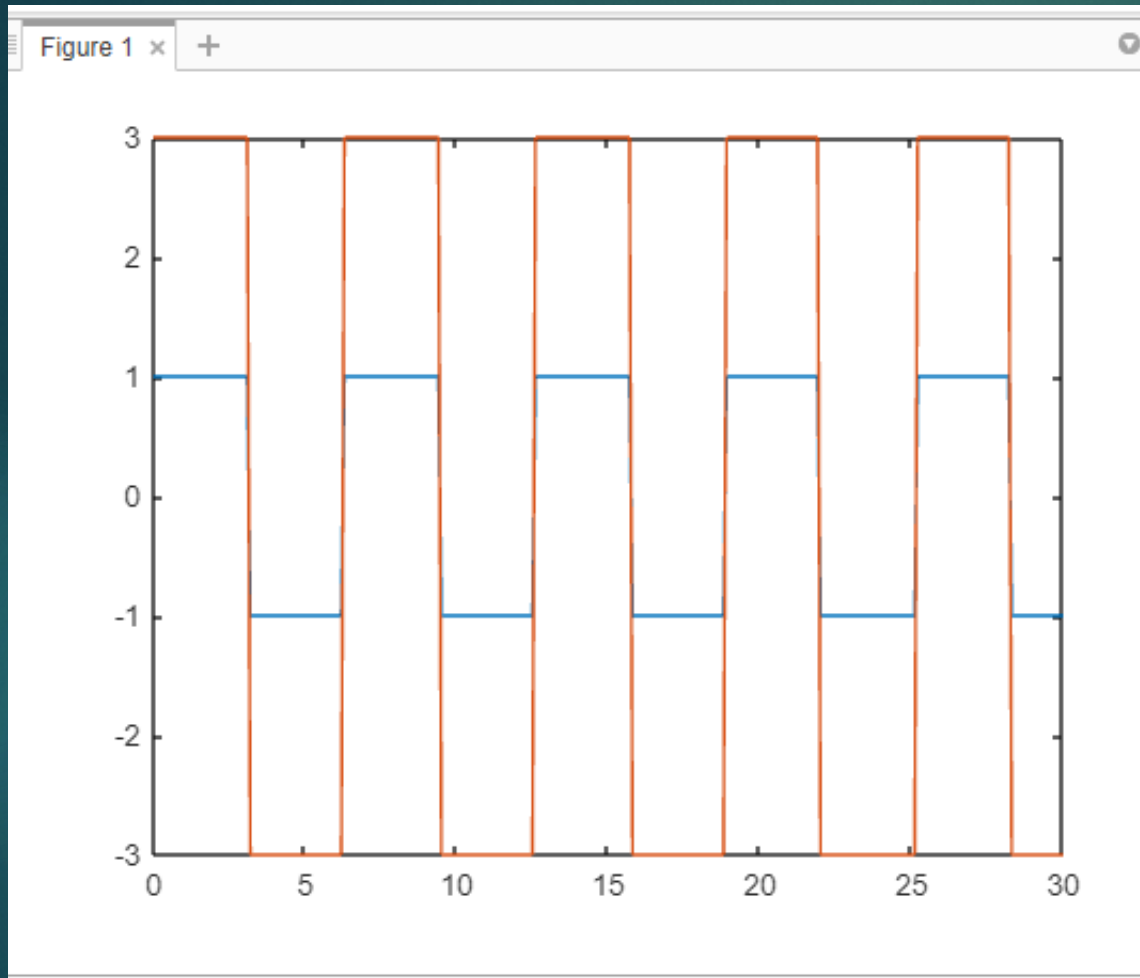
GRAPH;



The image shows a MATLAB editor window with four tabs: 'iee_q2a.m', 'iee_q2b.m', 'iee_q2c.m', and 'untitled4'. The 'iee_q2b.m' tab is active. The code in the editor is as follows:

```
1 Rf=30;  
2 Ri=15;  
3 t=0:0.1:30;  
4 vin=square(t);  
5 vout=(1+Rf/Ri).*vin;  
6 plot(t,vin)  
7 hold on  
8 plot(t,vout)
```

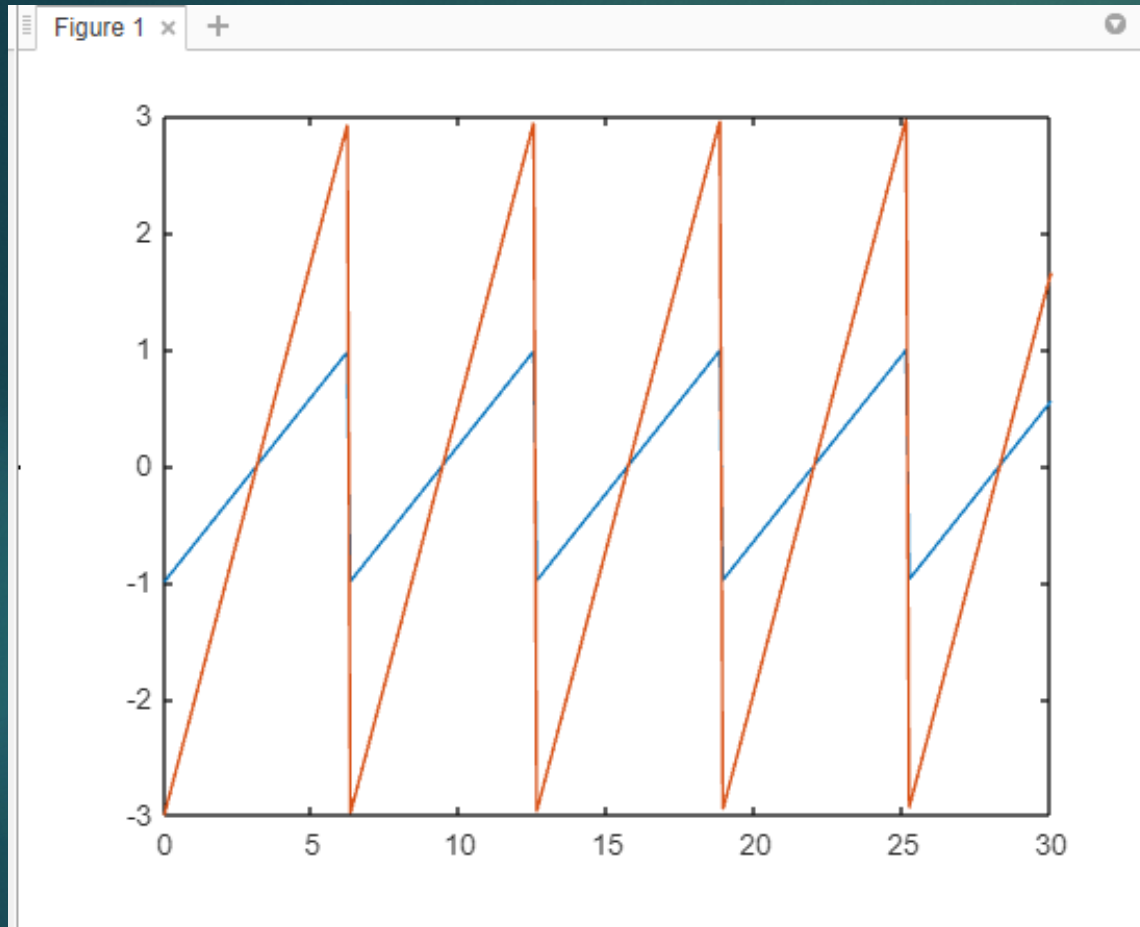
INPUT IS
SQUARE:
MATLAB CODE;



GRAPH;

```
iee_q2a.m x iee_q2b.m x iee_q2c.m x untitled4 x +
1 Rf=30;
2 Ri=15;
3 t=0:0.1:30;
4 vin=sawtooth(t);
5 vout=(1+Rf/Ri).*vin;
6 plot(t,vin)
7 hold on
8 plot(t,vout)|
```

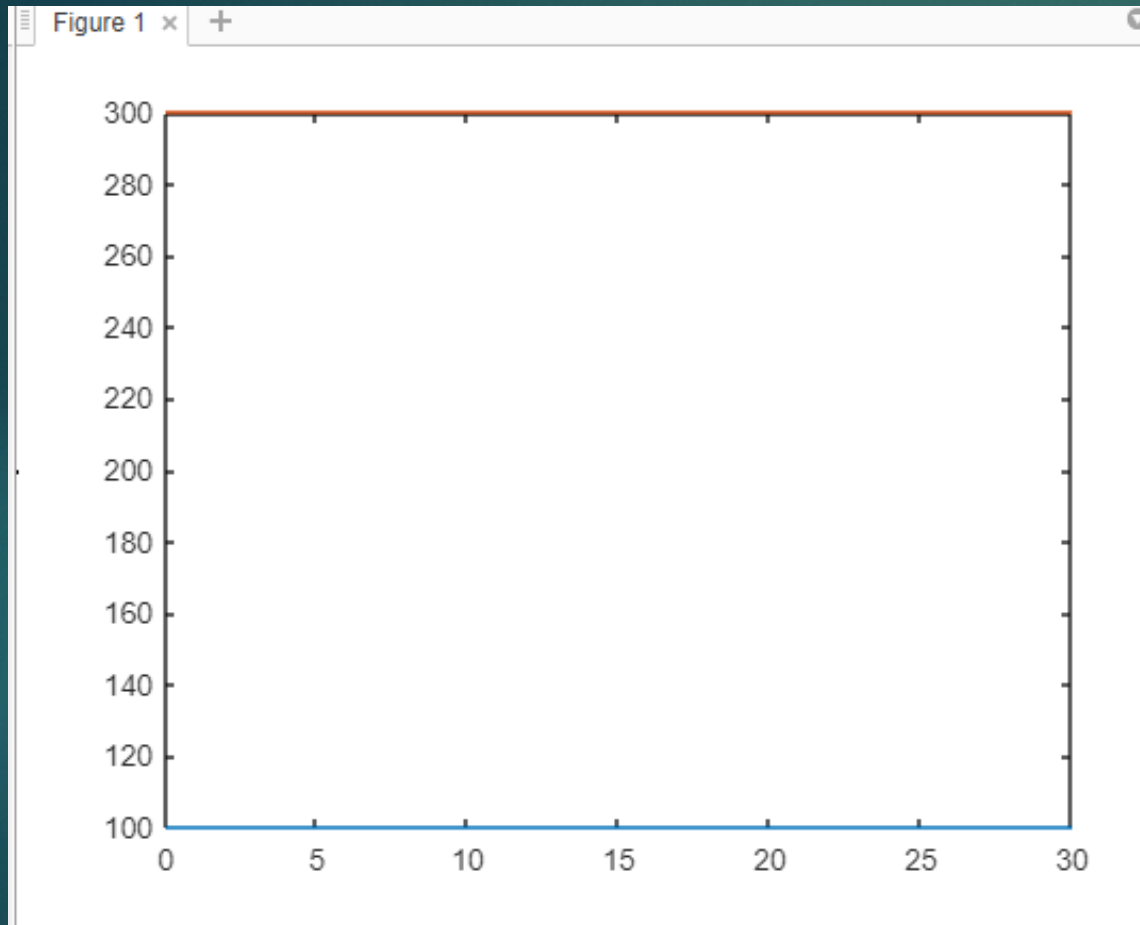
INPUT IS
TRIANGULAR
(SAWTOOTH):
MATLAB CODE;



GRAPH;

```
tee_q2a.m x tee_q2b.m x tee_q2c.m x TEE_Q2D.m x  
1 Rf=30;  
2 Ri=15;  
3 t=0:0.1:30;  
4 vin=(ones(size(t))*100); %consider 100 is constant dc supply  
5 vout=(1+Rf/Ri).*vin;  
6 plot(t,vin)  
7 hold on  
8 plot(t,vout)
```

INPUT IS
CONSTANT DC:
MATLAB CODE;



GRAPH;

Q3

- Create MATLAB codes to implement the OPAMP adder concept that combines 50% of the input sinusoid and 120% of the input triangular waves.

MATLAB CODE AND OUTPUT

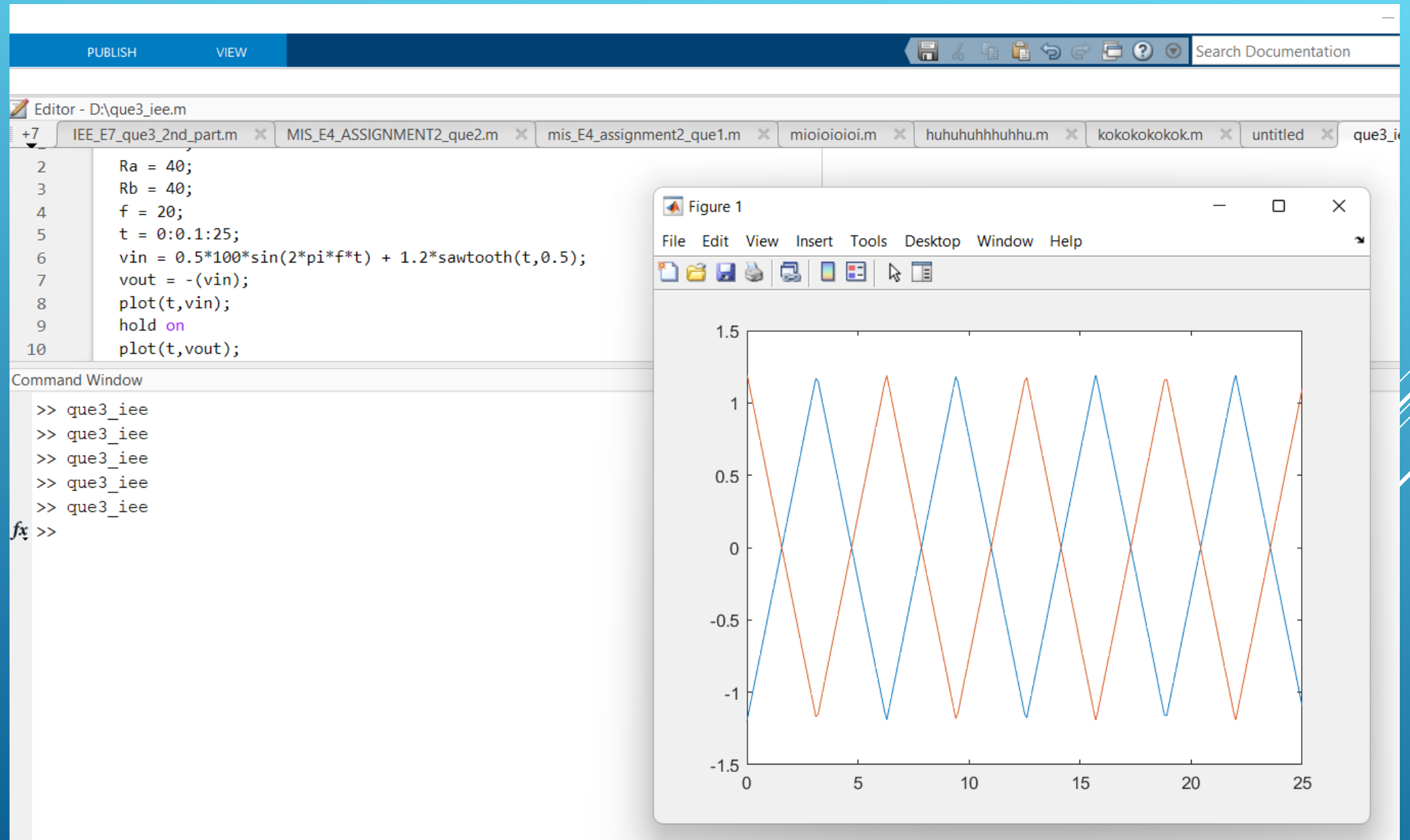


DIAGRAM:

