```
diary on
format compact
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%EEL3135 Fall 2018
%Lab 1 Part 1

%1.1.2
zvect([1 + j, j, 3 -4*j, exp(j*pi), exp(2j*pi/3)])
%Allows the plot of five vectors all on one graph as shown below.
```

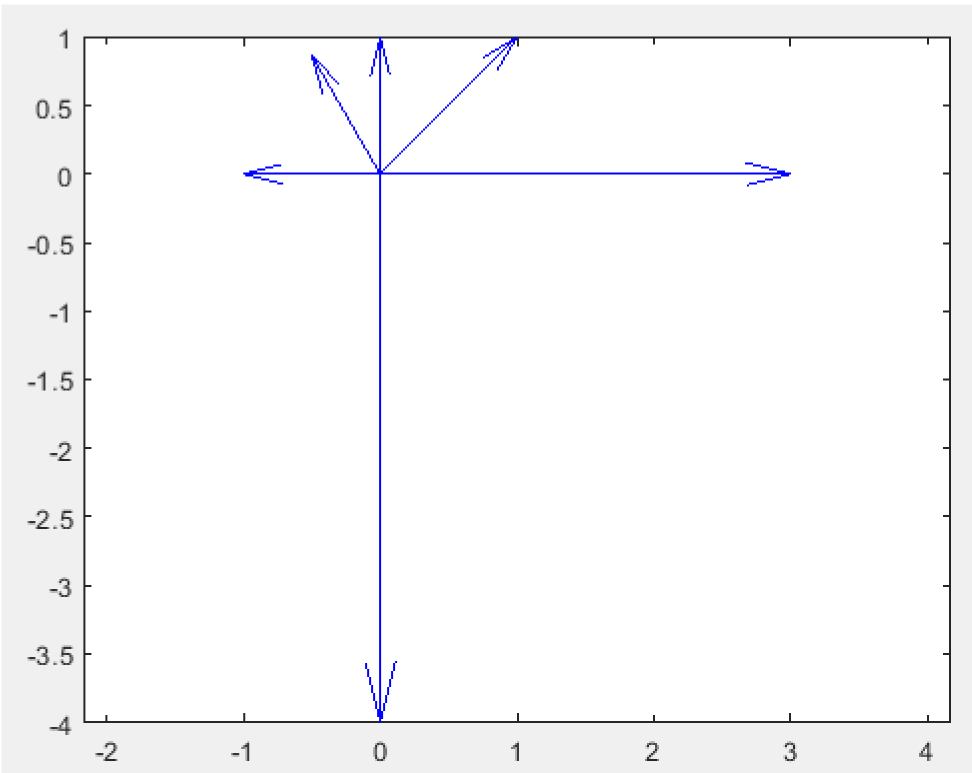

Figure 1: 1.1.2

Plot zvect

```
%1.1.3
z1=10*exp(-j*(2*pi/3))
z1 =
  -5.0000 - 8.6603i
%Initialize the value of z1.
z2=-5+5j
z2 =
  -5.0000 + 5.0000i
%Initialize the value of z2.


%1.1.3.1
zvect([z1,z2])
%Allows the plot the two set vectors (z1,z2) on one graph as shown below.
```

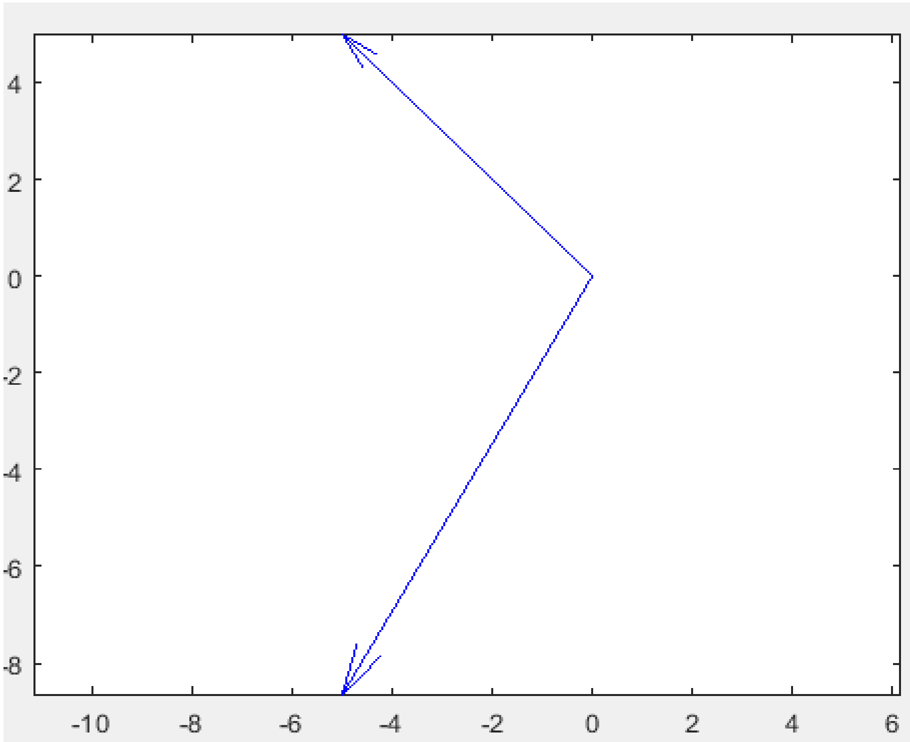

Figure 2: 1.1.3.1

Plot zvect(z1,z2)

z1 is pointed upward and z2 is pointed downward.

```
zprint([z1,z2])
 Z =      X     +      jY     Magnitude     Phase     Ph/pi    Ph(deg)
          -5        -8.66           10     -2.094    -0.667   -120.00
          -5            5        7.071      2.356     0.750    135.00

%The component breakdown of the complex number z1 and z2 is shown.


%1.1.3.2
zcat([1j, -1, -2j, 1])
```

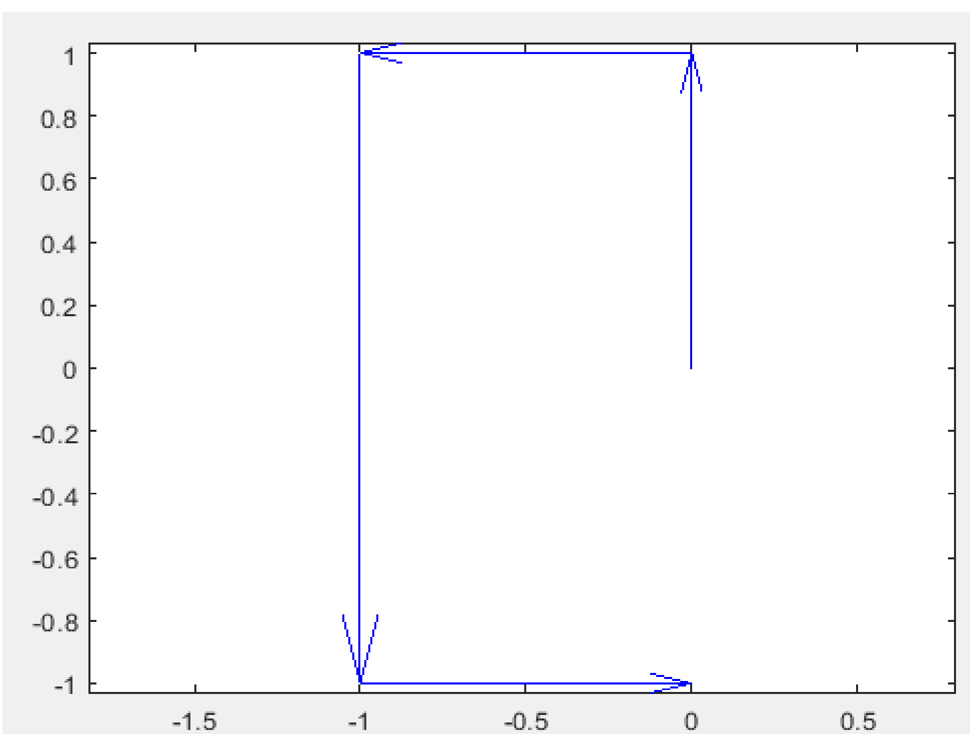

Figure 3: 1.1.3.2

Plot zcat

```
%A graph is presented with the given complex vectors plotted end to end.
%1j= goes up one, -1= goes left one, -2j= goes down twice, 1= goes right
%one.

%Question: What does zcat() do with a vector of complex numbers?
%zcat() plots each of the vector head to tail in a Real x Imagery plane in
%the complex vector order given.


%1.1.3.3
z3=z1+z2
z3 =
 -10.0000 - 3.6603i
zvect([z3])
```

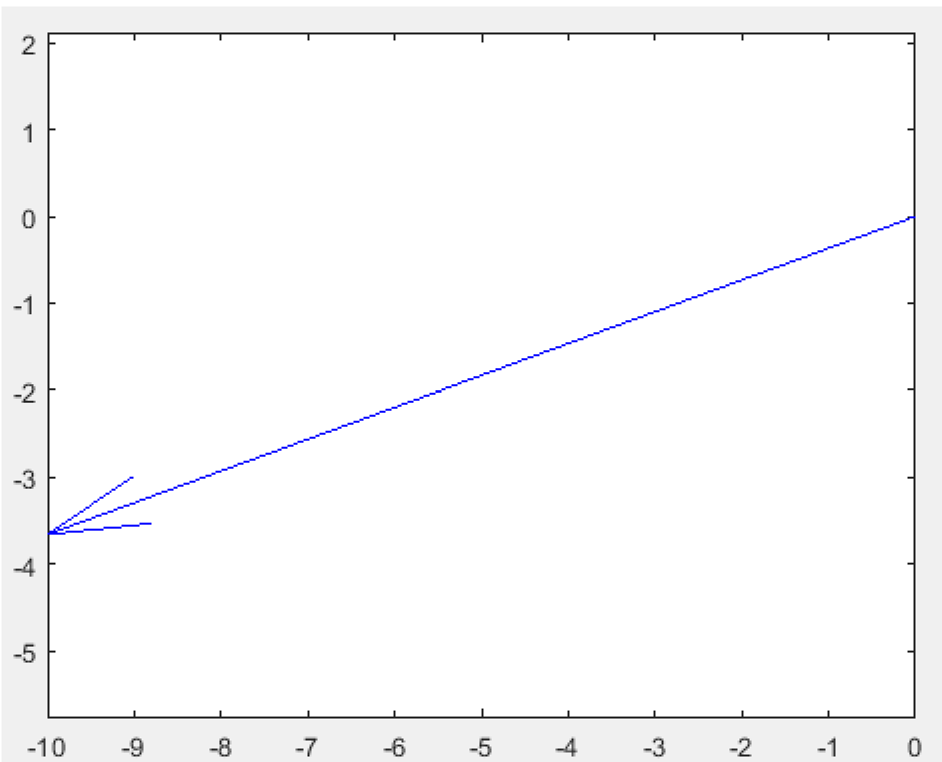

Figure 4: 1.1.3.3

Plot zvect sum z1+z2=z3

```
%Compute z1+z2, and plot the sum (z3) using zvect.
zcat([z1,z2])
hold on
zvect([z3])
```

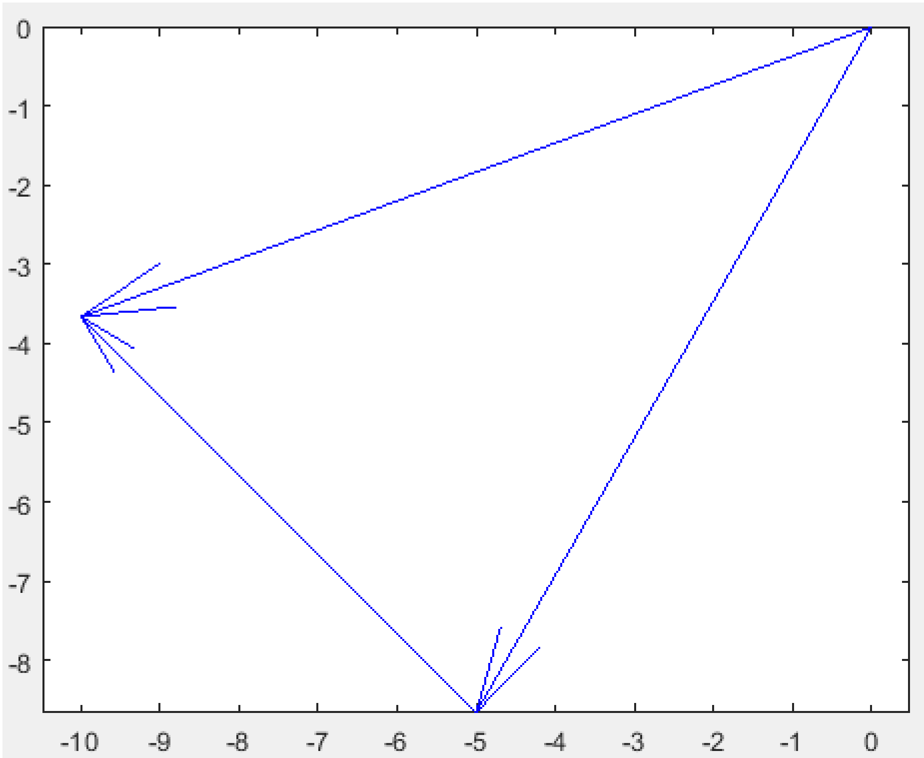

Figure 5: 1.1.3.3

Plot all three vectors (z1, z2, z1+z2)

```
%Plot all three vectors (z1,z2,z1+z2) on the same plot where and are
%concatenated using zcat.

zprint([z1,z2,z3])
 Z =      X     +      jY     Magnitude     Phase     Ph/pi    Ph(deg)
           -5         -8.66          10    -2.094    -0.667   -120.00
           -5             5       7.071     2.356     0.750    135.00
          -10         -3.66       10.65    -2.791    -0.888   -159.90

%Display the numerical values of z1,z2,z1+z2

%1.1.3.4
z5=z1*z2

z5 =

  68.3013 +18.3013i

%Compute the product z1*z2.
zprint([z5])
 Z =      X     +      jY     Magnitude     Phase     Ph/pi    Ph(deg)
        68.3          18.3       70.71     0.262     0.083     15.00

%Display the numerical result of the product z1*z2.
zvect([z1,z2,z5])
```

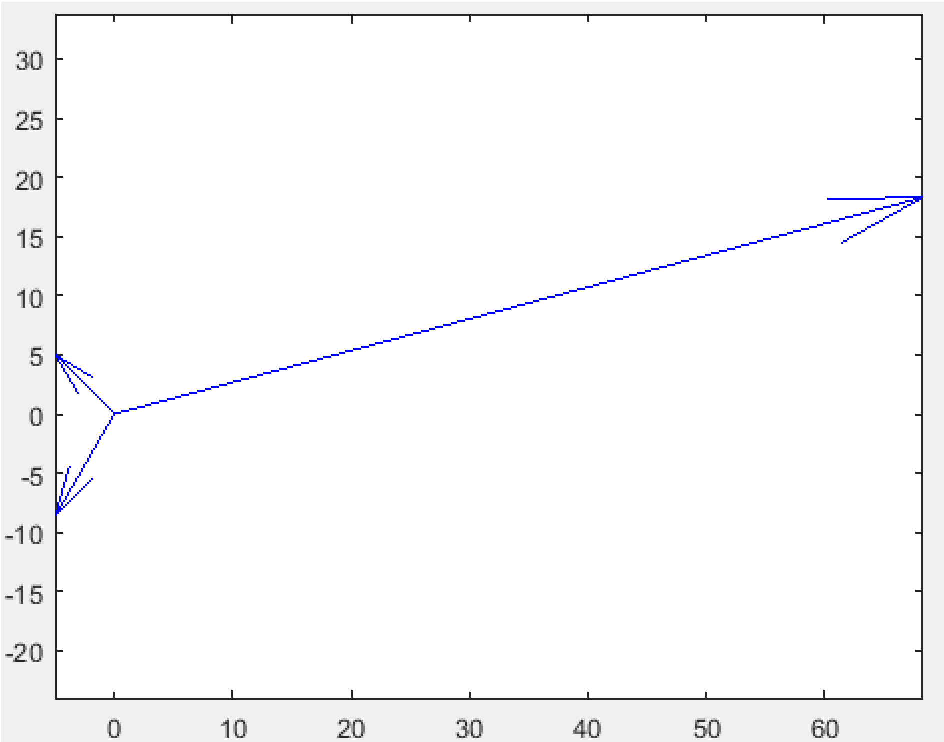

Figure 6: 1.1.3.4

Plot all three vectors (z1, z2, z1*z2)

```
%Question: What is the relationship between the two initial angles and the
%angle of the product?
%The angle of the product is the additional sum of the two initial angles.
%Angle1 = -120, Angle2 = 135, Angle3= Angle1+Angle2 = 15.

%1.1.3.5
z6=z2/z1

z6 =

  -0.1830 - 0.6830i

zprint([z6])
 Z =     X     +     jY     Magnitude    Phase    Ph/pi   Ph(deg)
      -0.183       -0.683      0.7071   -1.833   -0.583  -105.00

%Compute the quotient z2/z1=z6, Display the numerical result.
zvect([z1,z2,z6])
```

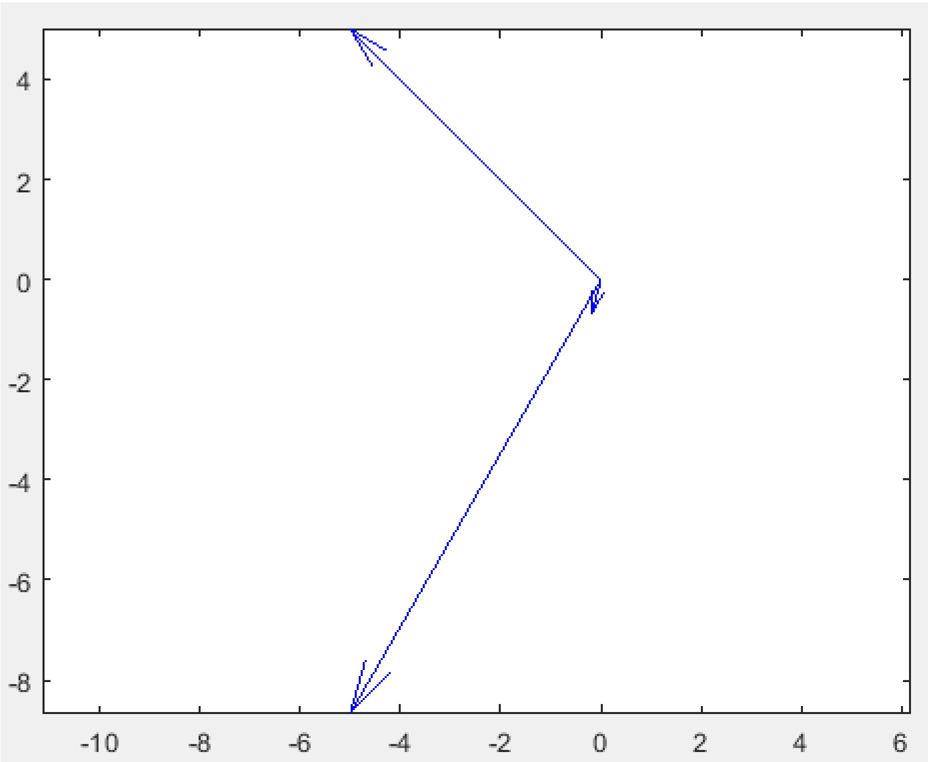

Figure 7: 1.1.3.5

Plot all three vectors (z1, z2, z2/z1)

```
%1.1.3.6
conj(z1)

ans =

  -5.0000 + 8.6603i

%The conjugates of z1.
conj(z2)

ans =

  -5.0000 - 5.0000i

%The conjugates of z2.
zprint([conj(z1),conj(z2)])
 Z =     X     +     jY     Magnitude    Phase     Ph/pi    Ph(deg)
          -5         8.66          10    2.094     0.667    120.00
          -5           -5       7.071   -2.356    -0.750   -135.00

%Display the numerical results.
zvect([conj(z1),conj(z2)])
```

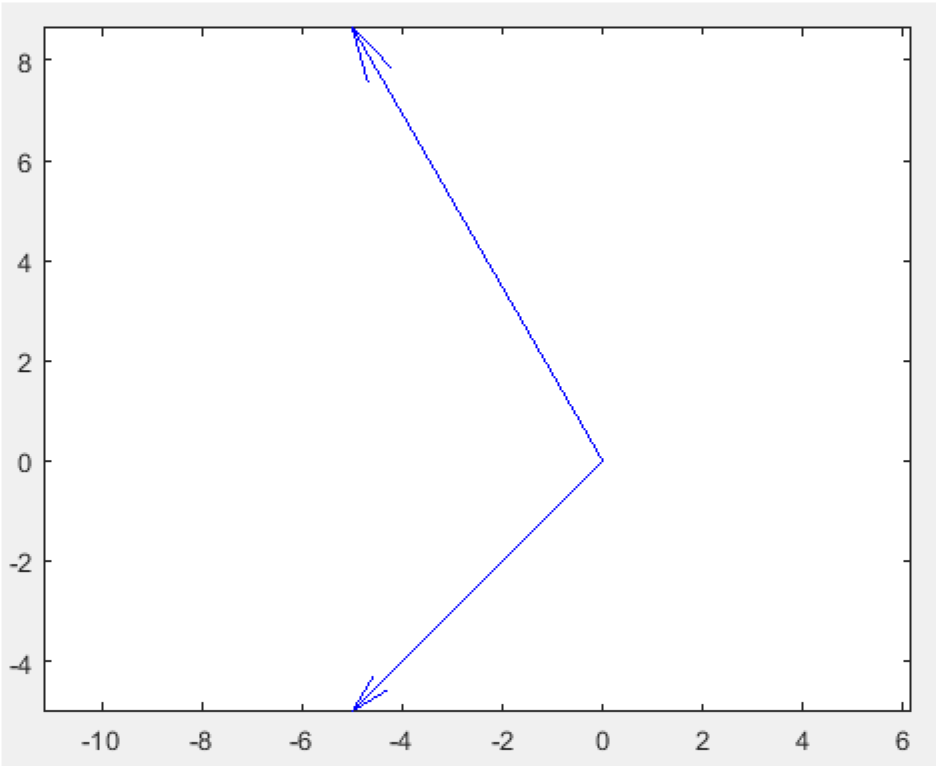

Figure 8: 1.1.3.6

Plot conjugates of z1 and z2.

```
%Plot the conjugates z1 and z2.

%1.1.3.7

i1=1/z1

i1 =

  -0.0500 + 0.0866i

i2=1/z2

i2 =

  -0.1000 - 0.1000i

%Compute 1/z1=i1 and 1/z2=i2.
zprint([i1,i2])
 Z =      X     +      jY      Magnitude     Phase     Ph/pi    Ph(deg)
       -0.05      0.0866          0.1     2.094     0.667    120.00
        -0.1        -0.1       0.1414    -2.356    -0.750   -135.00

%Display the numerical results.
zvect([i1,i2])
```

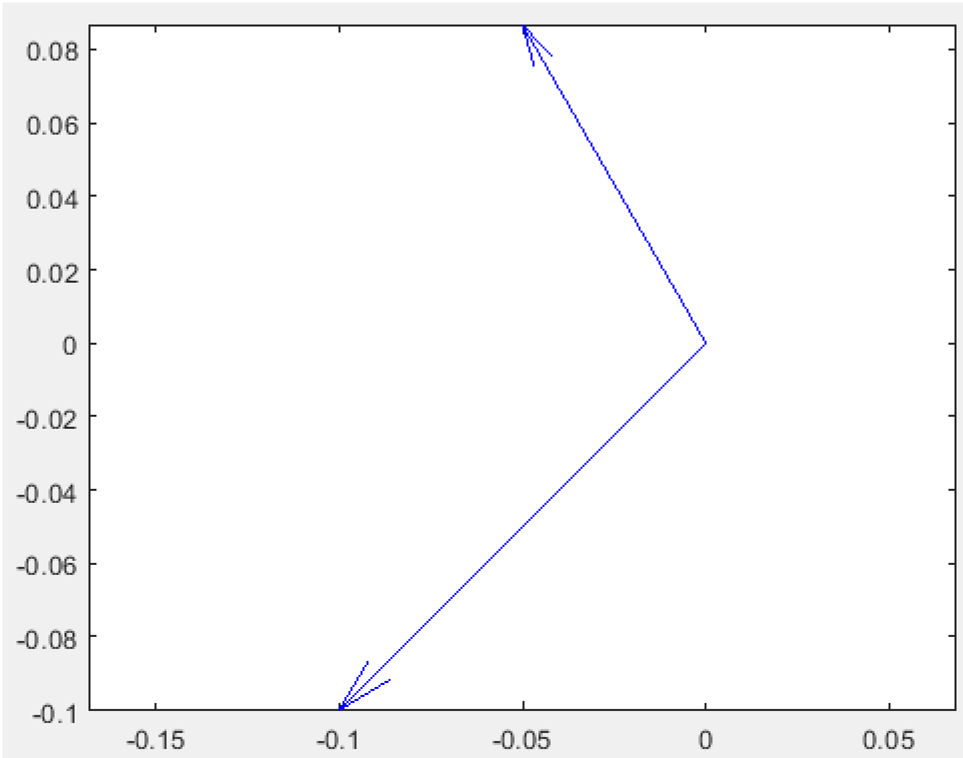

Figure 9: 1.1.3.7

Plot 1/z1 and 1/z2

```
%Plot i1=1/z1 and i2=1/z2.

%1.1.4
type mylab1

function [outputArg1,outputArg2] = mylab1(inputArg1,inputArg2)
%MYLAB1 Function provided for lab1.1.

%Code given.
tt = -1:0.01:1;
xx = cos(5*pi*tt);
zz = 1.4*exp(j*pi/2)*exp(j*5*pi*tt);
plot(tt, xx, 'b-', tt, real(zz), 'r--')
grid on
title('TEST PLOT OF A SINUSOID')
xlabel('TIME (sec)')

end
%Script file called mylab1.m

mylab1
```

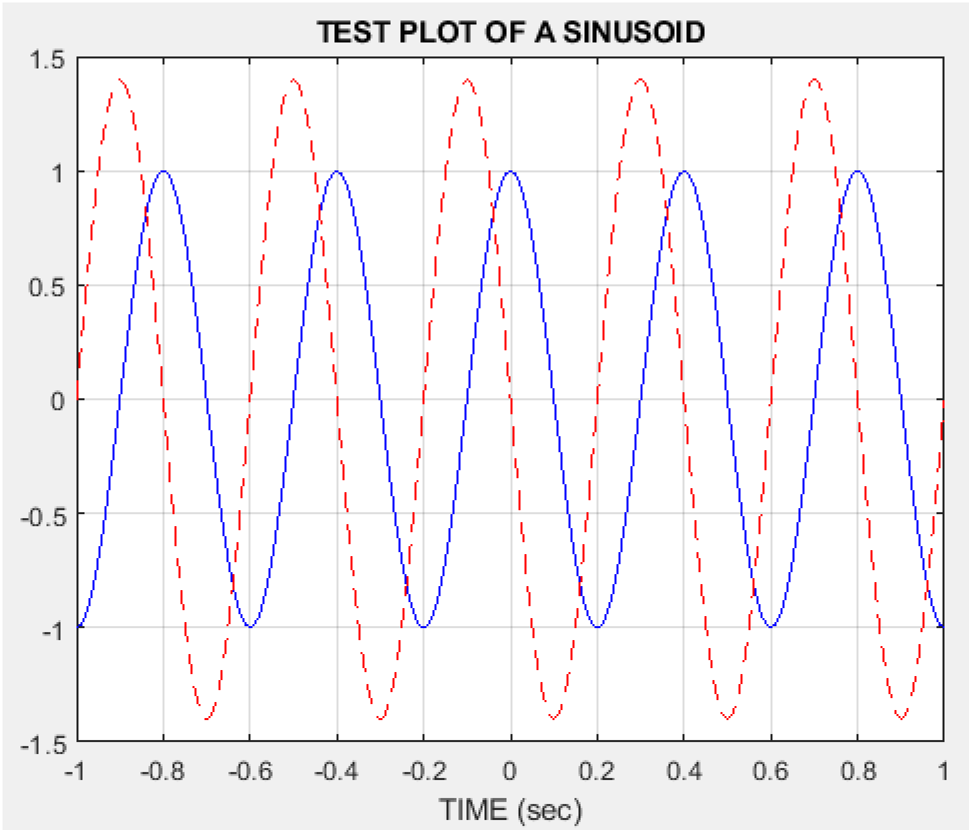

Figure 10: 1.1.4

Plot mylab1

```
%Question: Why the plot of real(zz) is a sinusoid even though no cos or sin
%is present in its equation?
%The plot of real(zz) is a sinusoid even though no cos or sin is present in
%its equation because of Euler Formula where the values of cos and sin are
%converted to exponential, e^(iwt)= cos(wt)+isin(wt). Therefore, the
%equivalent formula to create a sinusoid using cos or sin written as an
%exponential.


%Question: What is the phase and amplitude of it? Calculate the phase based
%on a time-shift measured from the plot.
%The amplitude is 1.4, obtained from viewing the graph.
%The phase is pi/2, there is a time shift to the left, creating a sin
%sinusoid which is equivalent to pi/2.


%1.2
type mylab1

function [outputArg1,outputArg2] = mylab1(inputArg1,inputArg2)
%MYLAB1 Function provided for lab1.1.
%Modify script: produces a 2000 Hz sound, with sampling frequency 11025Hz,
%which is 0.9 seconds long.
%The appropriate time vector is therefore tt = 0:1/11025:0.9;

%Code given.
tt = 0:1/11025:0.9;
```

```
xx = cos(4000*pi*tt);
zz = 1.4*exp(j*pi/2)*exp(j*4000*pi*tt);
plot(tt, xx, 'b-', tt, real(zz), 'r--')
grid on
title('TEST PLOT OF A SINUSOID')
xlabel('TIME (sec)')

end


tt = 0:1/11025:0.9;
xx = cos(4000*pi*tt);
zz = 1.4*exp(j*pi/2)*exp(j*4000*pi*tt);
%Fix clipping.
Fs = 11025;
%Sampling frequency.
audiowrite('mylab1.wav',zz,Fs);
%Create audio file.

%Question: What is the length of your tt vector?
%The tt vector has a length of 9923, going from zero to 0.9 in increments
%of 1/11025.
```