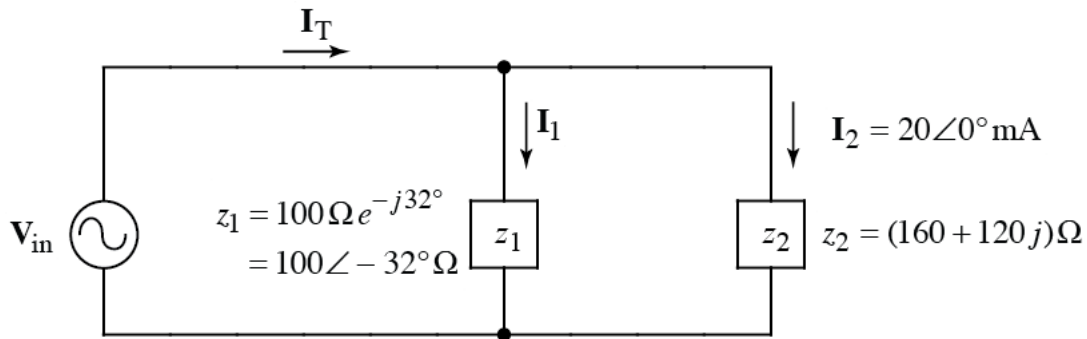




1.



- Find V_{in} in polar form.
- Find I_T
- Circle the correct statement (only one is correct):
 - The source current leads the source voltage
 - The source voltage leads the source current
- What is the numerical value of the phase angle between the voltage and the current?

SOL'N: a) $V_{in} = I_2 z_2 = 20 \text{ mA} * (160 + 120j) = 200 \angle 36.87^\circ = 4 \angle 36.87^\circ \text{ V}$

b) $I_1 = V_{in} / z_1 = \frac{4 \angle 36.87^\circ \text{ V}}{100 \angle -32^\circ \Omega} = 40 \angle 69^\circ \text{ mA} = 14.4 + j37.3 \text{ mA}$

$$I_T = I_1 + I_2 = 14.4 + j37.3 \text{ mA} + 20 \text{ mA} = 34.4 + j37.3 \text{ mA}$$

$$I_T = 50.8 \angle 47^\circ \text{ mA}$$

- Current leads voltage since the angle of the current is 47° , which is greater than the angle of the voltage, which is 37° .
- $47.3^\circ - 36.9^\circ = 10.4^\circ$

2.

Write a script file that does the following:

i) Creates an array called D containing the following data pts:

x values:	4	1	9	25
y values:	9	4	16	36

ii) Plots the data pts as green + signs on an x-y plot.

iii) Labels the x-axis as "x-axis", the y-axis as "y-axis", and titles the plot "Data".

iv) Uses polyfit() to find a linear fit for the data points in D.

v) Superimposes a plot of the linear fit on the data plot. The linear fit is to be shown as a red line.

SOL'N:

```
x = [4, 1, 9, 25];
y = [9, 4, 16, 36];
D = [x;y];
plot(x,y,'g+')
xlabel('x-axis')
ylabel('y-axis')
title('Data')
a = polyfit(x,y,1)
linefit = a(1)*x + a(2);
hold on
plot(x,linefit,'r-')
hold off % optional
```

3. Write a script file that makes a 3-D lit surface plot (using meshgrid()) with interpolated shading of the following function:

$$z = e^{-\alpha t} \cos(3\alpha t) \quad 0 \leq \alpha \leq 5 \text{ (11 pts)} \quad 0 \leq t \leq 1 \text{ (21 pts)}$$

SOL'N:

```
[xx,yy] = meshgrid(0:0.5:5,0:0.05:1);
z = exp(-xx.*yy).*cos(3*xx.*yy);
surfl(xx,yy,z)
shading interp
```

4. a) Write down a one-line Matlab® command to create the matrix A shown below.

$$A = \begin{bmatrix} 0 & i & 3 \\ i & 0 & 3 \\ 1 & 1 & 3 \end{bmatrix}$$

SOL'N:

```
>> [0,i,3;i,0,3;1,1,3]
```

b) Given the values in matrix A for part (a), find the value of

$$A([1,3], 1)$$

SOL'N:

$$A([1,3], 1) = [A(1,1); A(3,1)] = [0; 1]$$

c) Given the values in matrix A for part (a), find the value of

$$A(A(3, 2))$$

SOL'N:

$$A(A(3, 2)) = A(1) = 0$$

5. Write the exact code you would enter at the command prompt in Matlab to compute the following quantity:

$$\ln\left(\left|\sin^2 5 - e^{-3}\right|\right)$$

SOL'N:

```
>> log(abs(sin(5)^2-exp(-3)))
```

6. Suppose the following matrix has been defined in Matlab®:

$$C = \begin{bmatrix} 7 & 5 & 6 & 1 \\ 8 & 10 & 7 & 4 \\ 3 & 9 & 10 & 2 \end{bmatrix}$$

a) What is result of the following Matlab® command:

$$\text{sum}(C')$$

SOL'N:

$$\text{sum}(C') = \begin{matrix} \text{sum} & 7 & 8 & 3 \\ & 5 & 10 & 9 \\ & 6 & 7 & 10 \\ & 1 & 4 & 2 \end{matrix} = [19 \quad 29 \quad 24] \quad \% \text{sum}() \text{ takes sum of cols}$$

b) What is result of the following Matlab® command:

$$\text{min}(\text{max}(C))$$

SOL'N:

$$\text{min}(\text{max}(C)) = \text{min}([8 \quad 10 \quad 10 \quad 4]) = 4$$

7. Write down a one-line Matlab® command to create a horizontal array, called **xvec**, containing values from 0 to 2 spaced by 0.1. (The last value in the array should equal 2.)

SOL'N:

```
>> xec = 0:0.1:2
```

8. Given $t = 0.2 : 0.01 : 0.5$, write down a one-line Matlab® command to compute values of the following function for all values of t using only one command:

$$\left(\frac{t}{1-t}\right)\sin(2\pi t)$$

SOL'N:

```
>> t ./ (1 - t) .* sin(2 * pi * t)
```

9. Suppose the following matrices have been defined in Matlab®:

$$A = \begin{bmatrix} 3 & 1 \\ 2 & 5 \end{bmatrix} \quad B = \begin{bmatrix} 3 & 2 \\ 5 & 5 \end{bmatrix}$$

a) What is result of the following Matlab® command:

$$A(2,:) \sim B(:,1)'$$

SOL'N:

$$A(2,:) = [2, 5] \quad B(:,1)' = [3; 5]' = [3, 5] \quad \text{so result of } \sim \text{ is } [1, 0]$$

b) What is result of the following Matlab® command:

$$\text{find}(A < B)$$

SOL'N:

$$A < B \text{ gives } \begin{matrix} 0 & 1 \\ 1 & 0 \end{matrix} \text{ and the find() command gives indexes } \begin{matrix} 2 \\ 3 \end{matrix}$$

c) What is result of the following Matlab® command:

$$A(A == B) + 1$$

SOL'N:

$$A(A == B) + 1 \text{ gives } \begin{matrix} A(1,1) & 0 \\ 0 & 1 \end{matrix} + 1 = \begin{matrix} A(1,1) & + 1 \\ A(2,2) & \end{matrix} \text{ gives } \begin{matrix} 3+1 = 4 \\ 5+1 = 6 \end{matrix}$$

10. What is result of the following Matlab® command:

$$['A = ', \text{num2str}(3), ', ' , ''Indeed'']$$

SOL'N:

$$A = [3] \text{ 'Indeed'}$$