Engr. 126: MATLAB **Question Set #1** **Spring 2020**	Name

Answer these questions **WHILE GOING THROUGH Chapter 3 and 4** in the *MATLAB Workbook.*

Your answer will often be ***in words***. Use your own words.

Turn in Questions Set #1 as soon as you finish it (along with the Circuits Handout). Remember, QS #1 and 2 must be turned in by the end of the 8th class meeting, not at the end of the semester.

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1. Change the numerical formatting to **rational** by entering: `format rat` (***Page 15***). Write the results when you type in the following:

`5^(7/3)` `pi`

Before continuing, return the numerical formatting to short: `format short`

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2. Explain in your own words why the MATLAB function `atan2(a,b)` would be used instead of just `atan(c)`. `a` `b` and `c` are variables that represent numbers.
Assuming `a` and `b` are numbers, what does each represent in the `atan(a,b)` function?

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3. Consider complex number `z`. Explain in words what each of the following MATLAB functions does in general.

(a) `imag(z)`

(b) `abs(z)`

(c) `angle(z)`

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4. Write "5 divided by 3" as a fraction using the form that MATLAB calls ***left division*** (left division is important in matrix calculations).

5. VECTORS

5a. Write out the results of: **`d3 = [1:3]`** and **`d4 = [1:0.5:3]`**

5b. Enter: **`d = [1 2 3]`** and **`g = [6;7;8]`** (the vectors in ***Section 4.3.1, Page 32***). Then take their sum: **`sum(d,g)`**. Why can't you take the sum of vectors **`d`** and **`g`**?

5c. Why do you get two different results for **`d*g`** and **`g*d`** ? (see **`q`** and **`r`**, ***Page 34***).

5d. Explain why **`d^2`** does **not** work. (**see *Page 34***).

5e. Perform ***by hand*** the calculation **`k.^2`**; where **`k`** is the vector:

$$\mathbf{k} = \begin{bmatrix} 6 \\ 7 \\ 8 \end{bmatrix}$$

6. MATRICES

6a. When creating matrices in MATLAB, what does a semicolon **`(;)`** indicate?

6b. In words, what is the difference between **`A^2`** and **`A.^2`**? Assume **`A`** is a square matrix. Please remember the importance of the dot for future use.

6c. If $\mathbf{A} = \begin{bmatrix} 3 & 5 \\ 4 & 2 \end{bmatrix}$, calculate by hand: **`A^2`** and **`A.^2`**. Show your work.

6d. What's so "magic" about the results of the function: **`magic(a)`**, where **`a`** is a scalar?
(**see the comment on *Page 38***)

6e. If $M = \begin{bmatrix} 5 & 10 & 15 \\ 20 & 25 & 30 \\ 35 & 40 & 45 \end{bmatrix}$, what is **`M(6)`**? What is **`M(1,3)`**?

You should be able to do this "by hand", but check your answer with MATLAB.

6f. If **`M`** is a 3×3 matrix, what is the purpose of the following command? (see ***Section 4.7.3, Page 40***)

```
>>M([1 2],:) = M([2 1],:)
```

6g. If **`A`** is a 3×3 matrix, what is the result of the following command:

```
>>max(A)
```

7. Practice: Points on a Line, Multiplying Vectors

Write out the lines of MATLAB code required to execute ***Practice Problem 4.1*** **(Page 46)**.

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8. Practice: Creating Arrays, Extracting Columns

In your own words, explain – in words – each of these commands from ***Practice Problem 4.2*** **(*Page 46*)**.

```
>>clear


>>v=0:0.5:2


>>M=[v; sin(v); cos(v)]


>>M'


>>N=M(:,3:6)


>>P=N'


>>P(1)=2


>>size(M)
```

9. Solution to a System of Linear Equations

a. Determine the solution vector **x** for the following system of equations

(see **Practice Problem 4.3, Pg 47**):

$$\begin{aligned} 2x - 3y + 8z &= 20 \\ 5x + 2y - 7z &= 15 \\ -2x + 4y + 5z &= 10 \end{aligned} \qquad \mathbf{x} = \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} \quad \\ \quad \\ \quad \end{bmatrix}$$

b. Determine the solution vector **x** for the following system of equations:

(see **Practice Problem 4.4, Pg 47**):

$$\begin{aligned} 2x - 3y + 8z - 8w &= 25 \\ 5x + 2y - 7z + 2w &= -23 \\ -2x + 4y + 5z + 3w &= 10 \\ 7x + 9y \quad\quad + 11w &= 43 \end{aligned} \qquad \mathbf{x} = \begin{bmatrix} \quad \\ \quad \\ \quad \\ \quad \end{bmatrix}$$

Hint: since the coefficients of ***Prob. 9b*** are similar to ***Prob. 9a***, it might be efficient to use the Variable Editor (a.k.a., the Array Editor – that opens a window that looks like an Excel spreadsheet) to change the coefficient matrix and constant vector.

10. Circuit Problems

See HANDOUT

Solve the two circuit problems from the MESH ANALYSIS handout.
Turn in the handout with Question Set #1.