Roll. No. A016	Name: Varun Khadayate
Class B.Tech CsBs	Batch: 1
Date of Experiment: 19-07-2021	Subject: IT/WS

1. Launch MATLAB, create list of following variables in command window:
   a) m=10, n=25, p=43

   Ans:

```
>> m = 10

m =

   10

>> n = 25

n =

   25

>> p = 43

p =

   43
```

   b) $A=m^2$, $B=n^3$, $C=(A+B)*p$

   Ans:

```
>> A = m^2

A =

  100

>> B = n^3

B =

      15625

>> C = (A + B)*p

C =

     676175
```

c) t=0.1, f=0.5, a=5, x=a*sin(2πft)

Ans:

```
>> t = 0.1

t =

   0.1000

>> f = 0.5

f =

   0.5000

>> a = 5

a =

    5

>> x = a*sin(2*pi*f*t)

x =

   1.5451
```

d) y=mx+C

Ans:

```
>> y = m*x + C

y =

  6.7619e+05
```

e) k=$(t^2+1)\ (t^2-1)$

Ans:

```
>> k = (t^2 + 1)*(t^2 - 1)

k =

  -0.9999
```

2.

(a) From Question1 make a new variable ‘v’, overwriting part (c), i.e.,

$$x=a*\sin(2\pi ft)$$

by adding cosh(t)

Ans:

```
>> v = x + cosh(t)

v =

   2.5501
```

(b) Create variable ‘r’, store value to it to find the area of circle :

$$A=\pi r^2$$

where ‘r’ is the radius of circle. Further, using the built in function **namelengthmax** , find the maximum number of character in “A”.
[Hint: store value of ‘r’ as 10]

Ans:

```
>> r = 10

r =

   10

>> A = pi*r^2

A =

  314.1593

>> A = namelengthmax

A =

   63
```

3. Explore the solve command using MATLAB help and find the solution for the problem given :
X + 1 = 2, find X

Ans:

```
>> syms X
>> solve(X + 1 == 2, X)

ans =

1
```

4. Complete the table using **help** command:

Ans:

Command name	**Purpose**
whos	>> help whos whos List current variables, long form. whos is a long form of WHO. It lists all the variables in the current workspace, together with information about their size, bytes, class, etc. In a nested function, variables are grouped into those in the nested function and those in each of the containing functions, each group separated by a line of dashes. whos GLOBAL lists the variables in the global workspace. whos -FILE FILENAME lists the variables in the specified .MAT file. whos ... VAR1 VAR2 restricts the display to the variables specified. The wildcard character '*' can be used to display variables that match a pattern. For instance, whos A* finds all variables in the current workspace that start with A. whos -REGEXP PAT1 PAT2 can be used to display all variables matching the specified patterns using regular expressions. For more information on using regular expressions, type "doc regexp" at the command prompt. Use the functional form of whos, such as whos('-file',FILE,V1,V2), when the filename or variable names are stored as a character vector or string scalar. S = whos(...) returns a structure with the fields: name -- variable name size -- variable size bytes -- number of bytes allocated for the array class -- class of variable

	global -- logical indicating whether variable is global sparse -- logical indicating whether value is sparse complex -- logical indicating whether value is complex nesting -- struct with the following two fields: function -- name of function where variable is defined level -- nesting level of the function persistent -- logical indicating whether variable is persistent You must use the functional form of whos when there is an output argument. Examples for pattern matching: whos a* % Show variable names starting with "a" whos -regexp ^b\d{3}$ % Show variable names starting with "b" % and followed by 3 digits whos -file fname -regexp \d % Show variable names containing any % digits that exist in MAT-file fname See also who, clear, clearvars, save, load. Documentation for whos
clear	>> help clear clear Clear variables and functions from memory. clear removes all variables from the workspace. clear VARIABLES does the same thing. clear GLOBAL removes all global variables. clear FUNCTIONS removes all compiled MATLAB and MEX-functions. Calling clear FUNCTIONS decreases code performance and is usually unnecessary. For more information, see the clear Reference page. clear ALL removes all variables, globals, functions and MEX links. clear ALL at the command prompt also clears the base import list. Calling clear ALL decreases code performance and is usually unnecessary.

	For more information, see the clear Reference page. clear IMPORT clears the base import list. It can only be issued at the command prompt. It cannot be used in a function or a script. clear CLASSES is the same as clear ALL except that class definitions are also cleared. If any objects exist outside the workspace (say in userdata or persistent in a locked program file) a warning will be issued and the class definition will not be cleared. Calling clear CLASSES decreases code performance and is usually unnecessary. If you modify a class definition, MATLAB automatically updates it. For more information, see the clear Reference page. clear JAVA is the same as clear ALL except that java classes on the dynamic java path (defined using JAVACLASSPATH) are also cleared. clear VAR1 VAR2 ... clears the variables specified. The wildcard character '*' can be used to clear variables that match a pattern. For instance, clear X* clears all the variables in the current workspace that start with X. clear -REGEXP PAT1 PAT2 can be used to match all patterns using regular expressions. This option only clears variables. For more information on using regular expressions, type "doc regexp" at the command prompt. If X is global, clear X removes X from the current workspace, but leaves it accessible to any functions declaring it global. clear GLOBAL -REGEXP PAT removes global variables that match regular expression patterns.

	Note that to clear specific global variables, the GLOBAL option must come first. Otherwise, all global variables will be cleared. clear FUN clears the function specified. If FUN has been locked by MLOCK it will remain in memory. If FUN is a script or function that is currently executing, then it is not cleared. Use a partial path (see PARTIALPATH) to distinguish between different overloaded versions of FUN. For instance, 'clear inline/display' clears only the INLINE method for DISPLAY, leaving any other implementations in memory. Examples for pattern matching: clear a* % Clear variables starting with "a" clear -regexp ^b\d{3}$ % Clear variables starting with "b" and % followed by 3 digits clear -regexp \d % Clear variables containing any digits See also clearvars, who, whos, mlock, munlock, persistent, import. Documentation for clear Other functions named clear
pwd	>> help pwd pwd Show (print) current working directory. pwd displays the current working directory. S = pwd returns the current directory in the string S. See also cd. Documentation for pwd
diary	>> help diary diary Save text of MATLAB session. diary FILENAME causes a copy of all subsequent command window input and most of the resulting command window output to be appended to the named file. If no file is specified, the file 'diary' is used.

	diary OFF suspends it. diary ON turns it back on. diary, by itself, toggles the diary state. Use the functional form of diary, such as diary('file'), when the file name is stored in a string. See also save. Documentation for diary

5. Given *theta = 145 degrees*. A vector can be represented by its rectangular coordinates x and y or by its polar coordinates *r* and *theta*. Theta is measured in radians. The relationship between them is given by the equations:

   x = r * cos (theta)

   y = r * sin (theta)

   Assign values for the polar coordinates to variables r and theta. Then, using these values, assign the corresponding rectangular coordinates to variables x and y.

Ans:

```
>> r = 10

r =

   10

>> theta = 145

theta =

  145

>> x = r * cos(theta)

x =

   8.8386

>> y = r * sin(theta)

y =

   4.6775
```

6. The combined resistance Rr of three resistors R1, R2, and R3 in parallel is given by

$$R_r = \frac{1}{\frac{1}{R1} + \frac{1}{R2} + \frac{1}{R3}}$$

Create variables for the three resistors and store values in each, and then calculate the combined resistance. (Hint: consider R1=50Ω, R2=25Ω and R3=60Ω)

Ans:

```
>> R1 = 50

R1 =

    50

>> R2 = 25

R2 =

    25

>> R3 = 60

R3 =

    60

>> R = (1/((1/R1)+(1/R2)+(1/R3)))

R =

   13.0435
```

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1. The sum of a geometric series

$$1+r+r^2+r^3+\ldots\ldots\ldots+r^n= (1-r^N)/(1-r);$$

N=number of terms in a series.

Accept the value of r and n as input from keyboard. Verify the above equation

```
r = 2

r =

    2

>> N = 20

N =

   20

>> x = (1-r^N)/(1-r)

x =

    1048575
>> y = sum(r.^(0:N-1))

y =

    1048575

>> logical(x == y)

ans =

  logical

   1
```

2. Accept a square matrix A of any size from keyboard.

```
>> A = [9,9,3;7,2,7;2,8,5]

A =

     9     9     3
     7     2     7
     2     8     5
```

Find:

a. Size of A matrix

```
>> size(A)

ans =

     3     3
```

b. Determinant of A matrix

```
>> det(A)

ans =

 -447.0000
```

c. Display whether matrix A is singular or not

```
>> cond(A)

ans =

    4.0913
```

d. Transpose of A matrix

```
>> B = transpose(A)

B =

     9     7     2
     9     2     8
     3     7     5
```

e. Perform A+A’, A-A’

```
>> C = A + B

C =

   18   16    5
   16    4   15
    5   15   10

>> D = A - B

D =

    0    2    1
   -2    0   -1
   -1    1    0
```

f. Find inverse of A matrix

```
>> inv(A)

ans =

    0.1029    0.0470   -0.1275
    0.0470   -0.0872    0.0940
   -0.1163    0.1208    0.1007
```

g. Perform A*A’ and A.*A’

```
>> A*B

ans =

   171   102   105
   102   102    65
   105    65    93
>> A.*B

ans =

   81   63    6
   63    4   56
    6   56   25
```

h. Find square of A matrix

```
>> F = A*A

F =

   150   123   105
    91   123    70
    84    74    87
```

i. Find rank of A matrix

```
>> rank (A)

ans =

     3
```

j. Find eigenvalues and eigenvectors of A matrix

```
>> eig(A)

ans =

   17.5118
    4.3526
   -5.8644

>> [V,D] = eig(A)

V =

   -0.7183   -0.6835    0.3698
   -0.5284    0.1125   -0.7794
   -0.4527    0.7213    0.5058


D =

   17.5118         0         0
         0    4.3526         0
         0         0   -5.8644
```

3. Create a vector and a matrix with the following commands: v=0:0.2:12 and M=[sin(v); cos(v)]. Find the sizes of v and M and extract the first 10 elements of each row of the matrix and display them as column vectors.

```
>> v=0:0.2:12

v =

  Columns 1 through 12

       0    0.2000    0.4000    0.6000    0.8000    1.0000    1.2000    1.4000    1.6000    1.8000
2.0000    2.2000

  Columns 13 through 24

    2.4000    2.6000    2.8000    3.0000    3.2000    3.4000    3.6000    3.8000    4.0000
4.2000    4.4000    4.6000

  Columns 25 through 36

    4.8000    5.0000    5.2000    5.4000    5.6000    5.8000    6.0000    6.2000    6.4000
6.6000    6.8000    7.0000

  Columns 37 through 48

    7.2000    7.4000    7.6000    7.8000    8.0000    8.2000    8.4000    8.6000    8.8000
9.0000    9.2000    9.4000

  Columns 49 through 60

    9.6000    9.8000   10.0000   10.2000   10.4000   10.6000   10.8000   11.0000   11.2000
11.4000   11.6000   11.8000

  Column 61

   12.0000

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

M =

  Columns 1 through 12

       0    0.1987    0.3894    0.5646    0.7174    0.8415    0.9320    0.9854    0.9996    0.9738
0.9093    0.8085
    1.0000    0.9801    0.9211    0.8253    0.6967    0.5403    0.3624    0.1700   -0.0292   -
0.2272   -0.4161   -0.5885

  Columns 13 through 24
```

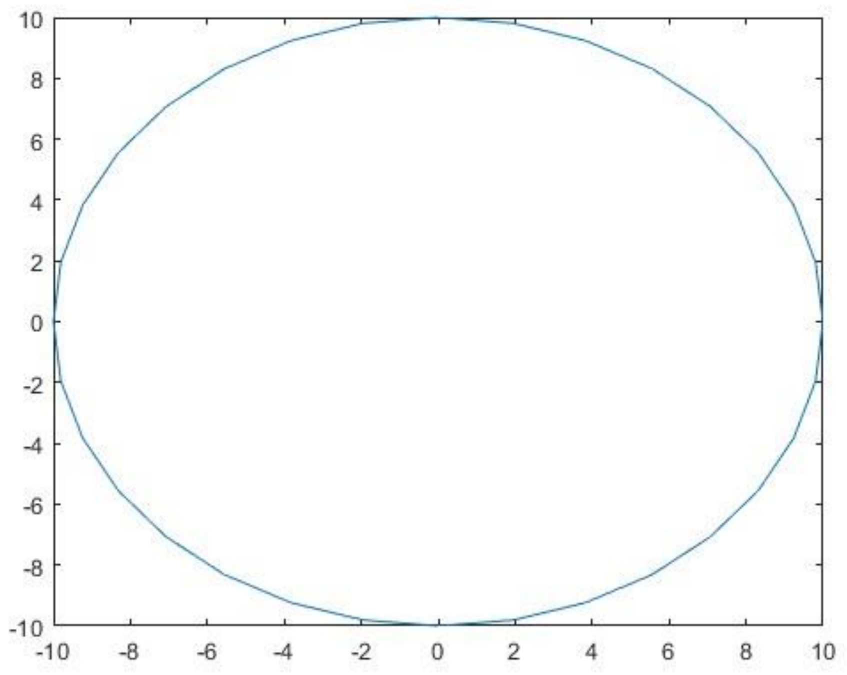
```
    0.6755    0.5155    0.3350    0.1411   -0.0584   -0.2555   -0.4425   -0.6119   -0.7568   -
0.8716   -0.9516   -0.9937
   -0.7374   -0.8569   -0.9422   -0.9900   -0.9983   -0.9668   -0.8968   -0.7910   -0.6536   -
0.4903   -0.3073   -0.1122

  Columns 25 through 36

   -0.9962   -0.9589   -0.8835   -0.7728   -0.6313   -0.4646   -0.2794   -0.0831    0.1165
0.3115    0.4941    0.6570
    0.0875    0.2837    0.4685    0.6347    0.7756    0.8855    0.9602    0.9965    0.9932
0.9502    0.8694    0.7539

  Columns 37 through 48

    0.7937    0.8987    0.9679    0.9985    0.9894    0.9407    0.8546    0.7344    0.5849
0.4121    0.2229    0.0248
    0.6084    0.4385    0.2513    0.0540   -0.1455   -0.3392   -0.5193   -0.6787   -0.8111   -
0.9111   -0.9748   -0.9997

  Columns 49 through 60

   -0.1743   -0.3665   -0.5440   -0.6999   -0.8278   -0.9228   -0.9809   -1.0000   -0.9792   -
0.9193   -0.8228   -0.6935
   -0.9847   -0.9304   -0.8391   -0.7143   -0.5610   -0.3853   -0.1943    0.0044    0.2030
0.3935    0.5683    0.7204

  Column 61

   -0.5366
    0.8439

>> size(v)

ans =

     1    61

>> size(M)

ans =

     2    61

>> M(:,1:10)

ans =

         0    0.1987    0.3894    0.5646    0.7174    0.8415    0.9320    0.9854    0.9996    0.9738
    1.0000    0.9801    0.9211    0.8253    0.6967    0.5403    0.3624    0.1700   -0.0292   -
0.2272
```

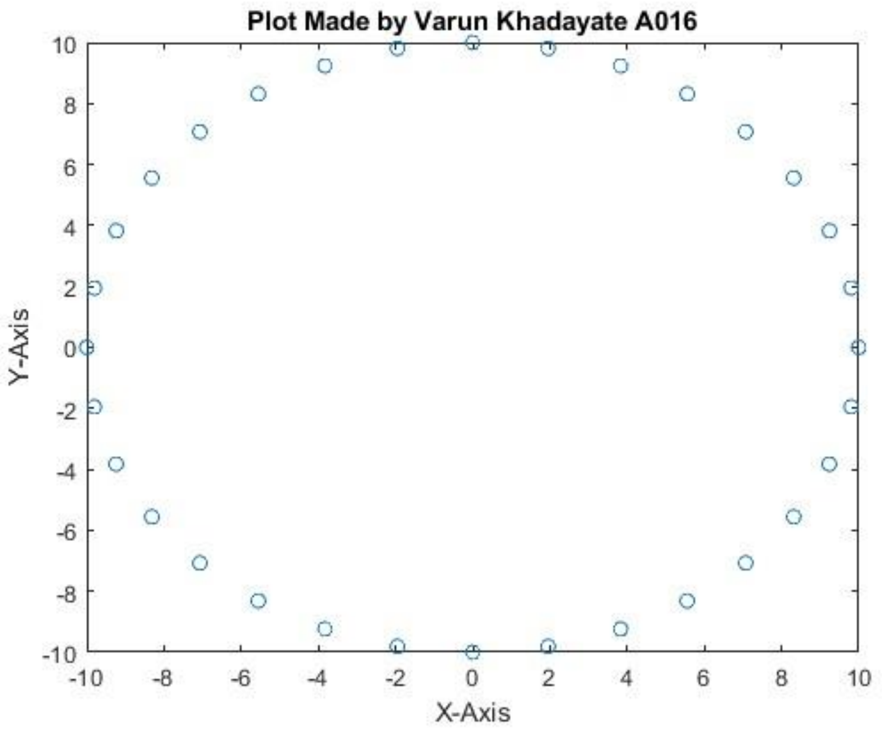
4. The polar equation of a circle is given by x=r cosθ, y=r sinθ. Take θ= 0 to 2π with step size of π/16 and plot the circle on x-y axis for given value of radius r. Give labels to axis and title to the figure. Make use of new figure and redraw the circle with distinct points shown by 'o' rather than a continuous plot. Now combine the two plots in new figure to show the line through the data points as well as the distinct data points.

```
>> theta = 0:pi/16:2*pi

theta =

  Columns 1 through 12

       0    0.1963    0.3927    0.5890    0.7854    0.9817    1.1781    1.3744    1.5708
1.7671    1.9635    2.1598

  Columns 13 through 24

    2.3562    2.5525    2.7489    2.9452    3.1416    3.3379    3.5343    3.7306    3.9270
4.1233    4.3197    4.5160

  Columns 25 through 33

    4.7124    4.9087    5.1051    5.3014    5.4978    5.6941    5.8905    6.0868    6.2832

>> x = r*cos(theta)

x =

  Columns 1 through 12

    2.0000    1.9616    1.8478    1.6629    1.4142    1.1111    0.7654    0.3902    0.0000   -
0.3902   -0.7654   -1.1111

  Columns 13 through 24

   -1.4142   -1.6629   -1.8478   -1.9616   -2.0000   -1.9616   -1.8478   -1.6629   -1.4142   -
1.1111   -0.7654   -0.3902

  Columns 25 through 33

   -0.0000    0.3902    0.7654    1.1111    1.4142    1.6629    1.8478    1.9616    2.0000

>> y = r*sin(theta)

y =

  Columns 1 through 12

       0    0.3902    0.7654    1.1111    1.4142    1.6629    1.8478    1.9616    2.0000
1.9616    1.8478    1.6629
```

```
  Columns 13 through 24

   1.4142    1.1111    0.7654    0.3902    0.0000   -0.3902   -0.7654   -1.1111   -1.4142   -
1.6629   -1.8478   -1.9616

  Columns 25 through 33

  -2.0000   -1.9616   -1.8478   -1.6629   -1.4142   -1.1111   -0.7654   -0.3902   -0.0000

>> r = 10

r =

   10

>> x = r*cos(theta)

x =

  Columns 1 through 12

  10.0000    9.8079    9.2388    8.3147    7.0711    5.5557    3.8268    1.9509    0.0000   -
1.9509   -3.8268   -5.5557

  Columns 13 through 24

  -7.0711   -8.3147   -9.2388   -9.8079  -10.0000   -9.8079   -9.2388   -8.3147   -7.0711   -
5.5557   -3.8268   -1.9509

  Columns 25 through 33

  -0.0000    1.9509    3.8268    5.5557    7.0711    8.3147    9.2388    9.8079   10.0000

>> y = r*sin(theta)

y =

  Columns 1 through 12

        0    1.9509    3.8268    5.5557    7.0711    8.3147    9.2388    9.8079   10.0000
9.8079    9.2388    8.3147

  Columns 13 through 24

   7.0711    5.5557    3.8268    1.9509    0.0000   -1.9509   -3.8268   -5.5557   -7.0711   -
8.3147   -9.2388   -9.8079

  Columns 25 through 33

 -10.0000   -9.8079   -9.2388   -8.3147   -7.0711   -5.5557   -3.8268   -1.9509   -0.0000
```

```
>> plot(x,y)
>> plot(x,y)
>> plot(x,y,'O')
>> plot(x,y,'O')
>> xlabel('X-Axis')
>> ylabel('Y-Axis')
>> title('Plot Made by Varun Khadayate A016')
```





Roll. No. A016	Name: Varun Khadayate
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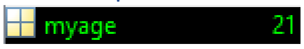
Date of Experiment: 29-07-2021	Subject: IT/WS

1. Create a variable myage and store your age in it. Subtract 2 from the value of the variable. Add 1 to the value of the variable. Observe the Workspace Window and Command History Window as you do this.

Command Window

>> myage = 21;

Workspace

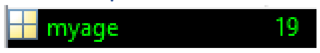


```
myage    21
```

Command Window

>> myage = myage - 2;

Workspace

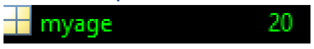


```
myage    19
```

Command Window

>> myage = myage + 1;

Workspace



```
myage    20
```

2. Explain the difference between these two statements:

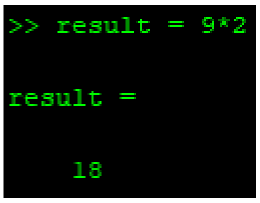
result = 9*2

result = 9*2;

Both will store 18 in the variable result. In the first, MATLAB will display this in the Command Window; in the second, it will not.

result = 9*2

Result shown in Command Window and in Worspace



```
>> result = 9*2

result =

    18
```

```
result = 9*2;
```

Result shown in Workspace and not in Command Window

```
result      18
```

3. Use the built-in function namelengthmax to find out the maximum number of characters that you can have in an identifier name under your version of MATLAB.

```
>> namelengthmax

ans =

   63
```

4. Create two variables to store a weight in pounds and ounces. Use who and whos to see the variables. Use class to see the types of the variables. Clear one of them and then use who and whos again.

```
>> pounds = 4;
>> ounces = 3.3;
>> who

Your variables are:

ans     myage   ounces  pounds  result

>> whos
  Name        Size            Bytes  Class     Attributes

  ans         1x1                 8  double
  myage       1x1                 8  double
  ounces      1x1                 8  double
  pounds      1x1                 8  double
  result      1x1                 8  double

>> clear pounds
>> who

Your variables are:

ans     myage   ounces  result

>> whos
  Name        Size            Bytes  Class     Attributes

  ans         1x1                 8  double
  myage       1x1                 8  double
  ounces      1x1                 8  double
  result      1x1                 8  double
```

5. Explore the format command in more detail. Use help format to find options. Experiment with format bank to display dollar values.

```
>> format +
>> 1234

ans =

+

>> -1234

ans =

-

>> format bank
>> 33.4

ans =

      33.40

>> 69.435

ans =

      69.44
```

6. Find a format option that would result in the following output format:

>> 5/16 + 2/7
ans =
67/112

```
>> format rat
>> 5/16 + 2/7

ans =

    67/112
```

7. Think about what the results would be for the following expressions, and then type them in to verify your answers.

*25 / 5 * 5*
4 + 3 ^ 2
(4 + 3) ^ 2
3 \ 12 + 5
*4 – 2 * 3*

```
>>  25/5*5
```

```
ans =

     25

>> 4+3^2

ans =

     13

>> (4+3)^2

ans =

     49

>> 3/12+5

ans =

     21/4

>> 4-2*3

ans =

     -2
```

8. Create a variable pounds to store a weight in pounds. Convert this to kilograms and assign the result to a variable kilos. The conversion factor is

   1 kilogram = 2.2 lb.

```
>> pounds = 69

pounds =

   69

>> kilos = pounds / 2.2

kilos =

  31.3636
```

9. Create a variable ftemp to store a temperature in degrees Fahrenheit (F). Convert this to degrees Celsius (C) and store the result in a variable ctemp. The conversion factor is

C = (F – 32) * 5/9.

```
>> f = 75

f =

   75

>>  c = (f - 32) * 5/9

c =

  23.8889
```

10. The following assignment statements either contain at least one error, or could be improved in some way. Assume that radius is a variable that has been initialized. First, identify the problem, and then fix and/or improve them:
    33 = number
    my variable = 11.11;
    area = 3.14 * radius^2;
    x = 2 * 3.14 * radius;

33 = number
The variable is always on the left ***number = 33***

my variable = 11.11;
Spaces are not allowed in variable names ***my_variable = 11.11;***

area = 3.14 * radius^2;
Using pi is more accurate than 3.14 ***area = pi * radius^2;***

x = 2 * 3.14 * radius;
x is not a descriptive variable name and Using pi is more accurate than 3.14
circumference = 2 * pi * radius;

11. Experiment with the functional form of some operators such as plus, minus, and times.

```
>> plus(6,9)

ans =

   15

>> plus(6,-9)

ans =
   -3

>> minus(1,7)

ans =

   -6

>> minus(4,-6)

ans =

   10

>> times(4,6)

ans =

   24

>> times(6,-7)

ans =

  -42
```

12. Generate a random
    a. real number in the range (0, 20)

```
>> rand * 20

ans =

  16.2945
```

    b. real number in the range (20, 50)

```
>> rand*(50-20)+20

ans =

  47.1738
```

c. integer in the inclusive range from 1 to 10

```
>> randi(10)

ans =

    2
```

d. integer in the inclusive range from 0 to 10

```
>> randi([0, 10])

ans =

   10
```

e. integer in the inclusive range from 50 to 100

```
>> randi([50, 100])

ans =

   82
```

13. Get into a new Command Window, and type rand to get a random real number. Make a note of the number. Then, exit MATLAB and repeat this, again making a note of the random number; it should be the same as before. Finally, exit MATLAB and again get into a new Command Window. This time, change the seed before generating a random number; it should be different.

```
>> rand

ans =

   0.0975

>> rng('shuffle')
>> rand

ans =

   0.3191
```

14. What is the difference between x and ‘x’?

In an expression, the first would be interpreted as the name of a variable, whereas ‘x’ is the character x.

15. Explain the difference between constants and variables.

Constants store values that are known and do not change. Variables are used when the value will change, or when the value is not known to begin with (e.g., the user will provide the value).

16. What would be the result of the following expressions?

'b' >= 'c' – 1

3 == 2 + 1

(3 == 2) + 1

xor(5 < 6, 8 > 4)

10 > 5 > 2

0 <= result <= 10

```
>> 'b' >= 'c' – 1
 'b' >= 'c' – 1
          ↑
Error: Invalid text character. Check for unsupported symbol, invisible character, or pasting of non-
ASCII characters.

>> 3 == 2 + 1

ans =

  logical

   1

>> xor(5 < 6, 8 >4)

ans =

  logical

   0

>> 10 > 5 > 2

ans =

  logical

   0

>> result = 3^2 - 20;
>> result = 3^2 - 20

result =
  -11

>> 0 <= result <= 10

ans =

  logical

   1
```

17. Create two variables x and y and store numbers in them. Write an expression that would be true if the value of x is greater than five or if the value of y is less than ten, but not if both of those are true.

```
>> x = 6

x =

     6

>> y = 9

y =

     9

>> xor(x > 5, y < 10)

ans =

  logical

   0
```

18. Use the equality operator to verify that 3*10^5 is equal to 3e5.

```
>> 3*10^5 == 3e5

ans =

  logical

   1
```

19. In the ASCII character encoding, the letters of the alphabet are in order: ‘a’ comes before ‘b’ and also ‘A’ comes before ‘B’. However, which comes first - lower or uppercase letters?

```
>> int32('a')

ans =

  int32

   97

>> int32('A')

ans =

  int32

   65
```

20. Are there equivalents to intmin and intmax for real number types? Use help to find out.

```
>> help intmax
 intmax Largest positive integer value.
    X = intmax is the largest positive value representable in an int32.
    Any value that is larger than intmax will saturate to intmax when
    cast to int32.

    intmax('int32') is the same as intmax with no arguments.

    intmax(CLASSNAME) is the largest positive value in the integer class
    CLASSNAME. Valid values of CLASSNAME are 'int8', 'uint8', 'int16',
    'uint16', 'int32', 'uint32', 'int64' and 'uint64'.

    intmax('like', Y) returns the largest positive value in the integer
    class with the same data type and complexity (real or complex) as the
    numeric variable Y.

    See also intmin, realmax.

    Documentation for intmax

>> help intmin
 intmin Smallest integer value.
    X = intmin is the smallest value representable in an int32.
    Any value that is smaller than intmin will saturate to intmin when
    cast to int32.

    intmin('int32') is the same as intmin with no arguments.

    intmin(CLASSNAME) is the smallest value in the integer class CLASSNAME.
    Valid values of CLASSNAME are 'int8', 'uint8', 'int16', 'uint16',
   'int32', 'uint32', 'int64' and 'uint64'.

   intmin('like', Y) returns the smallest value in the integer class with
   the same data type and complexity (real or complex) as the numeric
   variable Y.

   See also intmax, realmin.

   Documentation for intmin

>> realmin

ans =

  2.2251e-308

>> realmin('double')

ans =

  2.2251e-308

>> realmin('single')

ans =

  single

  1.1755e-38

>> realmax

ans =

  1.7977e+308
```

21. Use intmin and intmax to determine the range of values that can be stored in the types uint32 and uint64.

```
>> intmin('uint32')

ans =

  uint32

   0

>> intmax('uint32')

ans =
  uint32

   4294967295

>> intmin('uint64')

ans =

  uint64

   0

>> intmax('uint64')

ans =

  uint64

   18446744073709551615
```

22. Use the cast function to cast a variable to be the same type as another variable.

```
>> vara = uint16(6 + 9)

vara =

  uint16

   15

>> varb = 4*7

varb =

    28

>> class(varb)

ans =

    'double'

>> varb = cast(varb, 'like', vara)

varb =

  uint16

   28

>> class(varb)
```

```

ans =

   'uint16'
```

23. Use help elfun or experiment to answer the following questions:
    a. Is fix(3.5) the same as floor(3.5)?

```
>> fix(3.5)

ans =

     3

>> floor(3.5)

ans =

     3
```

    b. Is fix(3.4) the same as fix(-3.4)?

```
>> fix(3.4)

ans =

     3

>> fix(-3.4)

ans =

    -3
```

    c. Is fix(3.2) the same as floor(3.2)?

```
>> fix(3.2)

ans =

     3

>> floor(3.2)

ans =

     3
```

d. Is fix(-3.2) the same as floor(-3.2)?

```
>> fix(-3.2)

ans =

   -3

>> floor(-3.2)

ans =

   -4
```

e. Is fix(-3.2) the same as ceil(-3.2)?

```
>> fix(-3.2)

ans =

   -3

>> ceil(-3.2)

ans =

   -3
```

24.

a. For what range of values is the function round equivalent to the function floor?

For positive numbers: when the decimal part is less than .5
For negative numbers: when the decimal part is greater than or equal to .5

b. For what range of values is the function round equivalent to the function ceil?

For positive numbers: when the decimal part is greater than or equal to .5
For negative numbers: when the decimal part is less than .5

25. Use help to determine the difference between the rem and mod functions.

```
>> help rem
 rem    Remainder after division.
   rem(x,y) returns x - fix(x./y).*y if y ~= 0, carefully computed to
   avoid rounding error. If y is not an integer and the quotient x./y is
   within roundoff error of an integer, then n is that integer. The inputs
   x and y must be real and have compatible sizes. In the simplest cases,
   they can be the same size or one can be a scalar. Two inputs have
   compatible sizes if, for every dimension, the dimension sizes of the
   inputs are either the same or one of them is 1.

   By convention:
      rem(x,0) is NaN.
      rem(x,x), for x~=0, is 0.
      rem(x,y), for x~=y and y~=0, has the same sign as x.

   Note: MOD(x,y), for x~=y and y~=0, has the same sign as y.
   rem(x,y) and MOD(x,y) are equal if x and y have the same sign, but
   differ by y if x and y have different signs.

   See also mod.

   Documentation for rem
   Other functions named rem

>> help mod
 mod    Modulus after division.
   mod(x,y) returns x - floor(x./y).*y if y ~= 0, carefully computed to
   avoid rounding error. If y is not an integer and the quotient x./y is
   within roundoff error of an integer, then n is that integer. The inputs
   x and y must be real and have compatible sizes. In the simplest cases,
   they can be the same size or one can be a scalar. Two inputs have
   compatible sizes if, for every dimension, the dimension sizes of the
   inputs are either the same or one of them is 1.

   The statement "x and y are congruent mod m" means mod(x,m) == mod(y,m).

   By convention:
      mod(x,0) is x.
      mod(x,x) is 0.
      mod(x,y), for x~=y and y~=0, has the same sign as y.

   Note: REM(x,y), for x~=y and y~=0, has the same sign as x.
   mod(x,y) and REM(x,y) are equal if x and y have the same sign, but
   differ by y if x and y have different signs.

   See also rem.

   Documentation for mod
   Other functions named mod
```

26. Find MATLAB expressions for the following

$$\sqrt{19}$$

```
>> sqrt(19)

ans =
    4.3589
```

$3^{1.2}$

```
>> 3^1.2

ans =

    3.7372
```

tan(π)

```
>> tan(pi)

ans =

  -1.2246e-16
```

27. Using only the integers 2 and 3, write as many expressions as you can that result in 9. Try to come up with at least 10 different expressions (Note: don't just change the order). Be creative! Make sure that you write them as MATLAB expressions. Use operators and/or built-in functions.

```
>> 3^2

ans =

     9

>> 2^3+(3-2)

ans =

     9

>> 3*3

ans =

     9

>> 3^3-3*3*2

ans =

     9

>> 2^3+abs(2-3)

ans =
    9

>> 2^3+sign(3)

ans =

    9

>> 3/2*2*3

ans =

    9

>> 2\3*2*3

ans =

    9

>> sqrt(3^(2+2))

ans =

    9
```

28. A vector can be represented by its rectangular coordinates x and y or by its polar coordinates r and q. Theta is measured in radians. The relationship between them is given by the equations:

$$x = r * \cos(\Theta)$$

$$y = r * \sin(\Theta)$$

```
>> r = 46

r =

   46

>> theta = 0.7

theta =

   0.7000

>> x = r*cos(theta)

x =
  35.1827

>> y = r*sin(theta)

y =

  29.6340
```

29. In special relativity, the Lorentz factor is a number that describes the effect of speedon various physical properties when the speed is significant relative to the speed of light. Mathematically, the Lorentz factor is given as:

$$\gamma = \frac{1}{\sqrt{1-\frac{v^2}{c^2}}}$$

Use 3×10^8 m/s for the speed of light, *c*. Create variables for *c* and the speed *v* and fromthem a variable *lorentz* for the Lorentz factor.

```
>> c = 3e8

c =

  300000000

>> v = 2.9e8

v =

  290000000

>> lore = 1 / sqrt(1 - v^2/c^2)

lore =

   3.9057
```

30. A company manufactures a part for which there is a desired weight. There is a tolerance of N percent, meaning that the range between minus and plus N% of the desired weight is acceptable. Create a variable that stores a weight, and another variable for N (for example, set it to two). Create variables that store the minimum and maximum values in the acceptable range of weights for this part.

```
>> weight = 46.6917

weight =

  46.6917
```

```
>> N = 7

N =

     7

>> min = weight - weight*0.01*N

min =

   43.4233

>> max = weight + weight*0.01*N

max =

   49.9601
```

31. An environmental engineer has determined that the cost C of acontainment tank will be based on the radius *r* of the tank:

$$C = \frac{32430 + 428\pi}{r}$$

Create a variable for the radius, and then for the cost

```
>> radius = 46;
>> c = 32430/radius + 428*pi*radius

c =

    62556.68
```

32. A chemical plant releases an amount A of pollutant into a stream.The maximum concentration C of the pollutant at a point which is a distance x from the plant is:

$$C = \frac{A}{x}\sqrt{\frac{2}{\pi e}}$$

Create variables for the values of A and x, and then for C. Assume thatthe distance x is in meters. Experiment with different values for x.

```
>> A = 80000

A =

    80000.00
```

```
>> x = 100

x =

     100.00

>> C = A/x * sqrt(2/(pi*exp(1)))

C =

     387.15

>> x = 1000;

>> C = A/x * sqrt(2/(pi*exp(1)))

C =

      38.72

>> x = 20000;
>> C = A/x * sqrt(2/(pi*exp(1)))

C =

       1.94
```

33. The geometric mean g of n numbers x_i is defined as the nth root ofthe product of x_i:

$$g = \sqrt[n]{x_1 x_2 x_3 \ldots x_n}$$

(This is useful, for example, in finding the average rate of return for aninvestment which is something you'd do in engineering economics). Ifan investment returns 15% the first year, 50% the second, and 30% the third year, the average rate of return would be (1.15*1.50*1.30)$^{1/3}$.) Compute this.

```
>> x1 = 1.15

x1 =

       1.15

>> x2 = 1.5

x2 =

       1.50
```

```
>> x3 = 1.3

x3 =

        1.30

>> g = nthroot(x1*x2*x3, 3)

g =

        1.31
```

34. Use the **deg2rad** function to convert 180 degrees to radians.

```
>> deg2rad(180)

ans =

        3.14
```

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Date of Experiment: 29-07-2021	Subject: IT/WS

1. If a variable has the dimensions 3 x 4, could it be considered to be (Check all that apply):
   - [✓ a. a matrix]
   - b. a row vector
   - c. a column vector
   - [✓ d. a scalar]

2. If a variable has the dimensions 1 x 5, could it be considered to be (Check all that apply):
   - [✓ a. a matrix]
   - [✓ b. a row vector]
   - c. a column vector
   - [✓ d. a scalar]

3. If a variable has the dimensions 5 x 1, could it be considered to be (Check all that apply):
   - [✓ a. a matrix]
   - b. a row vector
   - [✓ c. a column vector]
   - [✓ d. a scalar]

4. If a variable has the dimensions 1 x 1, could it be considered to be (Check all that apply):
   - [✓ a. a matrix]
   - [✓ b. a row vector]
   - [✓ c. a column vector]
   - [✓ d. a scalar]

5. Using the colon operator, create the following row vectors

```
2        3        4        5        6        7

1.1000          1.3000        1.5000        1.7000

8        6        4        2
```

```
>> 2:7

ans =

      2.00       3.00       4.00       5.00       6.00       7.00
>> 1.1000:0.2000:1.7000

ans =

   1.1000    1.3000    1.5000    1.7000
>> 8:-2:2

ans =

    8    6    4    2
```

6. Using a built-in function, create a vector vec which consists of 20 equally spaced points in the range from –pi to +pi.

```
>> vec = linspace(0,2*pi,20)

vec =

  Columns 1 through 12

      0    0.3307    0.6614    0.9921    1.3228    1.6535    1.9842    2.3149    2.6456    2.9762    3.3069
3.6376

  Columns 13 through 20

    3.9683    4.2990    4.6297    4.9604    5.2911    5.6218    5.9525    6.2832
```

7. Write an expression using linspace that will result in the same as 2: 0.2: 3

```
>> linspace(2,3,6)

ans =

    2.0000    2.2000    2.4000    2.6000    2.8000    3.0000
```

8. Using the colon operator and also the linspace function, create the following row vectors:

```
-5    -4    -3    -2    -1

 5     7     9

 8     6     4
```

```
>> -5:-1

ans =

    -5    -4    -3    -2    -1

>> linspace(-5,-1,5)

ans =

    -5    -4    -3    -2    -1

>> 5:2:9

ans =

     5     7     9

>> linspace(5,9,3)

ans =
    5     7     9

>> 8:-2:4

ans =

    8     6     4

>> linspace(8,4,3)

ans =

    8     6     4
```

9. How many elements would be in the vectors created by thefollowing expressions?
   a. linspace(3,2000)

      100 (always, by default)

   b. logspace(3,2000)

      50 (always, by default – although these numbers would get very large quickly; most would be represented as Inf)

10. Create a variable myend which stores a random integer in the inclusive range from 5 to 9. Using the colon operator, create a vector that iterates from 1 to myend in steps of 3.

```
>> myend = randi([5, 9])

myend =

    9

>> vec = 1:3:myend

vec =

    1     4     7
```

11. Using the colon operator and the transpose operator, create a column vector myvec that has the values -1 to 1 in steps of 0.5.

```
>> rowVec = -1: 0.5: 1

rowVec =

   -1.0000   -0.5000         0    0.5000    1.0000

>> rowVec'

ans =
   -1.0000
   -0.5000
        0
    0.5000
    1.0000
```

12. Write an expression that refers to only the elements that have odd- numbered subscripts in a vector, regardless of the length of the vector. Test your expression on vectors that have both an odd and even number of elements.

```
>> vec = 1:8

vec =

     1     2     3     4     5     6     7     8

>> vec(1:2:end)

ans =

     1     3     5     7

>> vec = 4:12

vec =

     4     5     6     7     8     9    10    11    12

>> vec(1:2:end)

ans =

     4     6     8    10    12
```

13. Generate a 2 x 4 matrix variable mat. Replace the first row with 1:4. Replace the third column (you decide with which values).

```
>> mat = [2:5; 1 4 11 3]

mat =

     2     3     4     5
     1     4    11     3

>> mat(1,:) =      1:4

mat =

     1     2     3     4
     1     4    11     3

>> mat(:,3) =      [4;3]
```

```
mat =

   1   2   4   4
   1   4   3   3
```

14. Generate a 2 x 4 matrix variable *mat*. Verify that the number ofelements is the product of the number of rows and columns

```
>> mat = randi(20,2,4)

mat =

   6    5   14    4
  15    1    9    6

>> [r c] = size(mat)

r =

   2


c =

   4

>> numel(mat) == r * c

ans =

  logical

   1
```

15. Which would you normally use for a matrix: length or size? Why?

Size, because it tells you both the number of rows and columns.

16. When would you use length vs. size for a vector?

If you want to know the number of elements, you'd use length. If you want to figure out whether it's a row or column vector, you'd use size.

17. Generate a 2 x 3 matrix of random
    a. real numbers, each in the range (0, 1)

```
>> rand(2,3)

ans =

   0.0334   0.0782   0.7775
   0.0746   0.4518   0.1108
```

b. real numbers, each in the range (0, 10)

```
>> rand(2,3)*10

ans =

   0.0534    6.6795    6.0724
   9.5356    6.9165    9.2982
```

c. integers, each in the inclusive range from 5 to 20

```
>> randi([5, 20],2,3)

ans =

   17   16   13
   14   11   14
```

18. Create a variable rows that is a random integer in the inclusive range from 1 to 5. Create a variable cols that is a random integer in the inclusive range from 1 to 5. Create a matrix of all zeros with the dimensions given by the values of rows and cols.

```
>> rows = randi([1,5])

rows =

    3

>> cols = randi([1,5])

cols =

    2

>> zeros(rows,cols)

ans =

    0     0
    0     0
    0     0
```

19. Create a matrix variable mat. Find as many expressions as you can that would refer to the last element in the matrix, without assuming that you know how many elements or rows or columns it has (i.e., make your expressions general).

```
>>  mat = [12:15; 6:-1:3]

mat =

   12   13   14   15
    6    5    4    3

>> mat(end,end)
```

```
ans =

    3

>> mat(end)

ans =

    3

>> [r c] = size(mat)

r =

    2


c =

    4

>> mat(r,c)

ans =

    3
```

20. Create a vector variable vec. Find as many expressions as you can that would refer to the last element in the vector, without assuming that you know how many elements it has (i.e., make your expressions general).

```
>> vec = 1:2:9

vec =

    1    3    5    7    9

>> vec(end)

ans =

    9

>> vec(numel(vec))

ans =

    9

>> vec(length(vec))
```

```
ans =

    9

>> v = fliplr(vec)

v =

    9    7    5    3    1

>> v(1)

ans =

    9
```

21. Create a 2 x 3 matrix variable mat. Pass this matrix variable to each of the following functions and make sure you understand the result: flip, fliplr, flipud, and rot90. In how many different ways can you reshape it?

```
>> mat = randi([1,20], 2,3)

mat =

   19   20    3
    8   19   10

>> flip(mat)

ans =

    8   19   10
   19   20    3

>> fliplr(mat)

ans =

    3   20   19
   10   19    8

>> flipud(mat)

ans =

    8   19   10
   19   20    3

>> rot90(mat)

ans =
    3    10
   20    19
   19     8

>> rot90(rot90(mat))

ans =

   10    19     8
    3    20    19

>> reshape(mat,3,2)

ans =

   19    19
    8     3
   20    10

>> reshape(mat,1,6)

ans =

   19     8    20    19     3    10

>> reshape(mat,6,1)

ans =

   19
    8
   20
   19
    3
   10
```

22. What is the difference between fliplr(mat) and mat = fliplr(mat)?

fliplr(mat) stores the result in ans so mat is not changed.
mat = fliplr(mat)changes mat.

23. Use reshape to reshape the row vector 1:4 into a 2x2 matrix; store this in a variable named mat. Next, make 2x3 copies of mat using both repelem and repmat.

```
>> mat = reshape(1:4,2,2)

mat =

    1     3
    2     4

>> repelem(mat,2,3)
```

```
ans =

     1     1     1     3     3     3
     1     1     1     3     3     3
     2     2     2     4     4     4
     2     2     2     4     4     4

>> repmat(mat,2,3)

ans =

     1     3     1     3     1     3
     2     4     2     4     2     4
     1     3     1     3     1     3
     2     4     2     4     2     4
```

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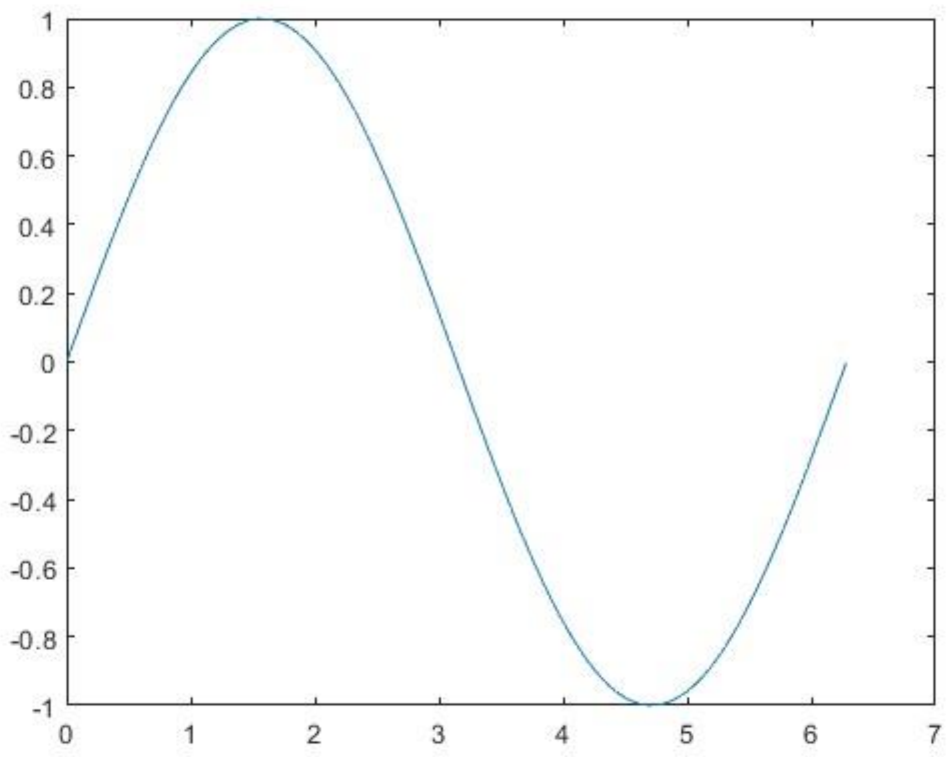
Date of Experiment: 18-09-2022	Subject: ITWS

Lab 5: Basic Plotting

1. Creates a 2-D line plot of the data in y versus the corresponding values in x. Create x as a vector of linearly spaced values between 0 and 2π. Use an increment of π/100 between the values. Create y as sine values of x. Calling the plot function will display the x versus y data on a scaled viewing domain and range.

```
x = 0:pi/100:2*pi;

y = sin(x);

plot(x,y)
```



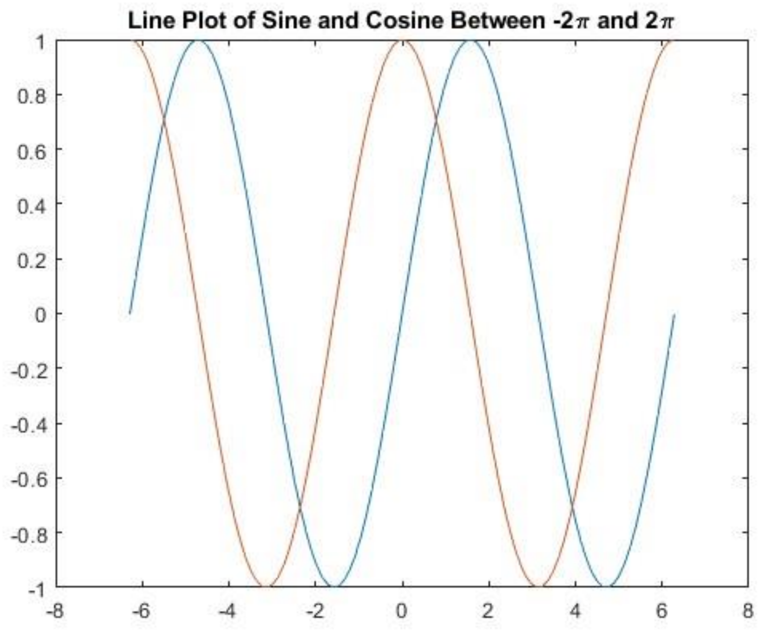
2. Explore various specifications of plot command and put it in a tabular format.

Specification	**Purpose**	**Syntax**	**Example**
xlabel, ylabel	`xlabel(txt)` labels the *x*-axis of the current	`xlabel('string')` `ylabel('string')`	xlabel('X-Axis') ylabel('Y-Axis')

	axes or standalone visualization. `ylabel(txt)` labels the y-axis of the current axes or standalone visualization.		
title	`title(titletext)` adds the specified title to the current axes or standalone visualization.	title('string')	title('Plot between X-axis and Y-axis')
legend	The legend automatically updates when you add or delete data series from the axes. This command creates a legend in the current axes, which is returned by the `gca` command.	`legend`	legend('x','y')

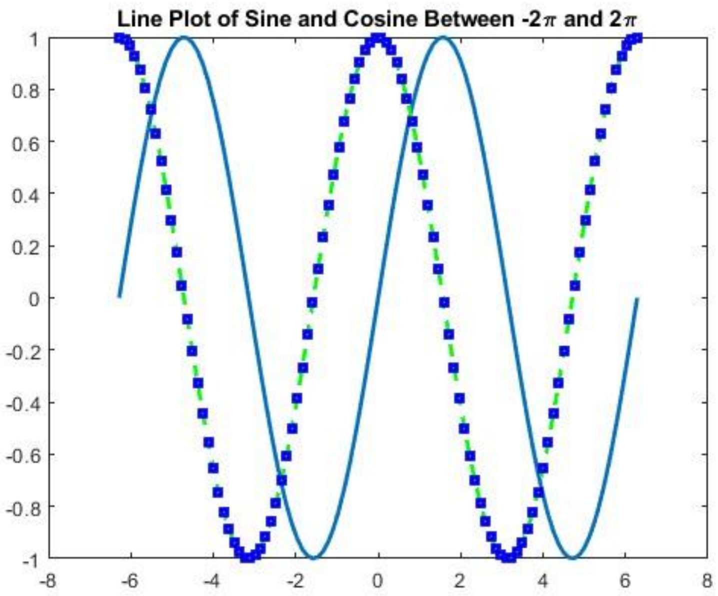
3. Create x as 100 linearly spaced values between −2π and 2π. Create y1 and y2 as sine and cosec values of x. Plot both sets of data. Add a title to the chart by using the title function. To display the Greek symbol π, use pi.

```
x = linspace(-2*pi,2*pi,100);
y1 = sin(x);
y2 = cos(x);
figure
plot(x,y1,x,y2)
title('Line Plot of Sine and Cosine Between -2\pi and 2\pi')
```



4. In the above plot, use the LineSpec option to specify a dashed green line with square markers. Use Name,Value pairs to specify the line width, point marker size, and point marker colors. Set the marker edge color to blue and set the marker face color using an RGB color value.

```
x = linspace(-2*pi,2*pi,100);

y1 = sin(x);

y2 = cos(x);

figure

plot(x,y1,x,y2,'--gs',...

    'LineWidth',2,...

    'MarkerSize',5,...

    'MarkerEdgeColor','b',...

    'MarkerFaceColor',[0.5,0.5,0.5])

title('Line Plot of Sine and Cosine Between -2\pi and 2\pi')
```

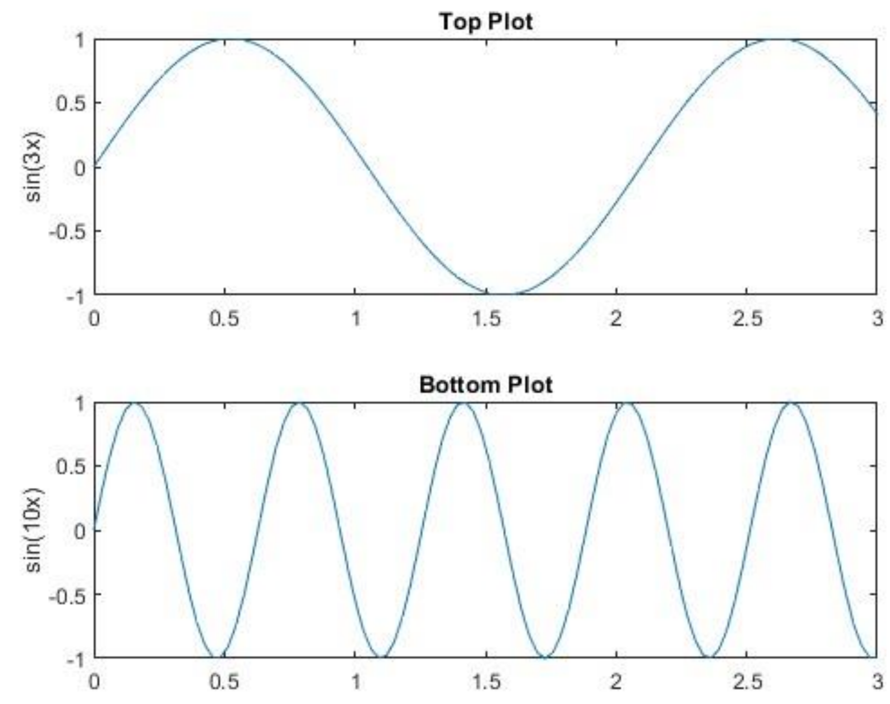


5. Display Multiple Plots in a Figure Window : Call the tiledlayout function to create a 2-by-1 tiled chart layout. Call the nexttile function to create an axes object and return the object as ax1. Create the top plot by passing ax1 to the plot function. Add a title and y-axis label to the plot by passing the axes to the title and ylabel functions. Repeat the process to create the bottom plot.

   (y = sin(3x) %for 1st plot)

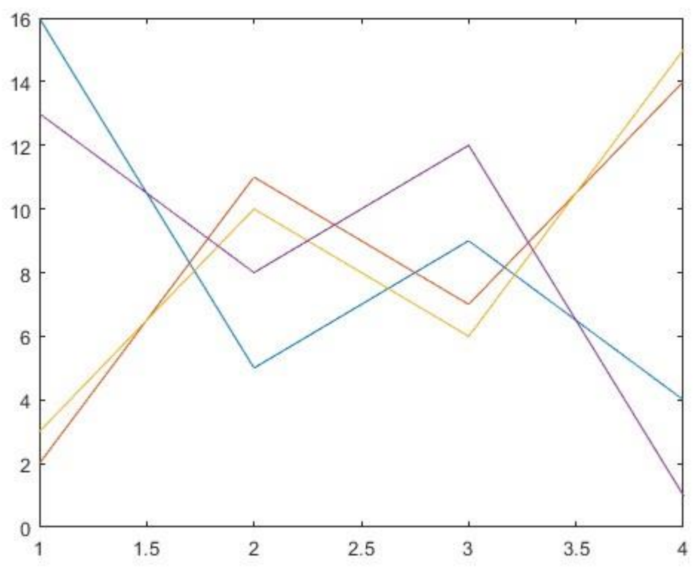
   (y = sin(10x) %for 2nd plot)

```
x = linspace(0,3);
y1 = sin(3*x);
y2 = sin(10*x);
tiledlayout(2,1)


% Top plot
ax1 = nexttile;
plot(ax1,x,y1)
title(ax1,'Top Plot')
ylabel(ax1,'sin(3x)')


% Bottom plot
ax2 = nexttile;
plot(ax2,x,y2)
title(ax2,'Bottom Plot')
ylabel(ax2,'sin(10x)')
```



6. Define Y as the 4-by-4 matrix returned by the magic function. Create a 2-D line plot of Y. MATLAB® plots each matrix column as a separate line.

```
Y = magic(4);

figure

plot(Y)
```



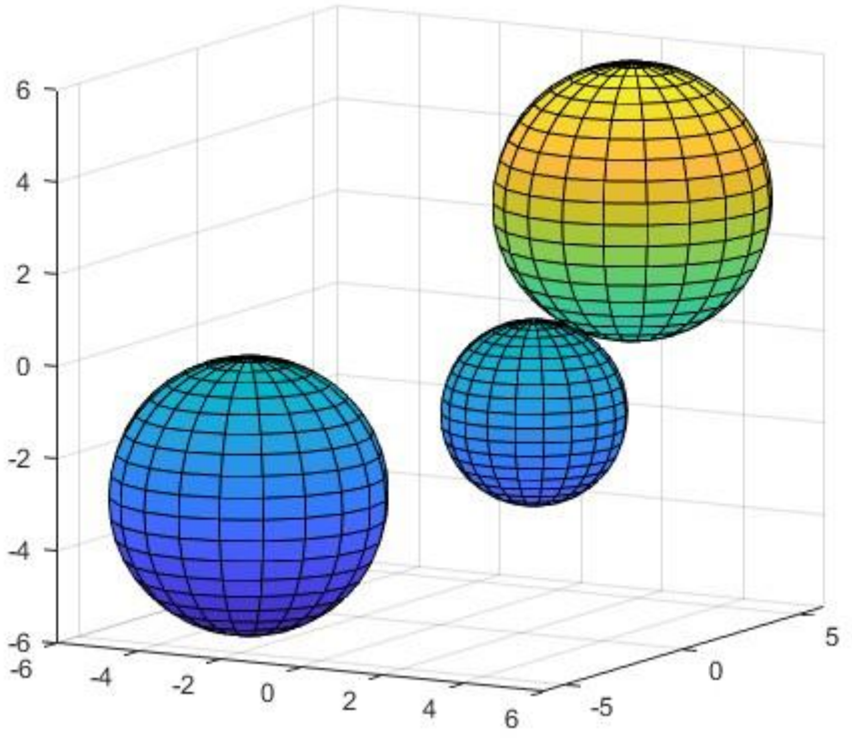
Roll No.: A016	Name: Varun Khadayate
Class: B. Tech CsBs	Batch: 1
Date of Experiment: 18-09-2022	Subject: ITWS

Lab 6: M-script file

1.
   a. Create a file called mysphere.mat
   b. Create and plot a sphere using sphere function. Sphere function creates a unit circle which can be scaled using surf function (hint: try different values of ‘r’ using surf function).
   c. Run and observe the output
   d. What is your observation?

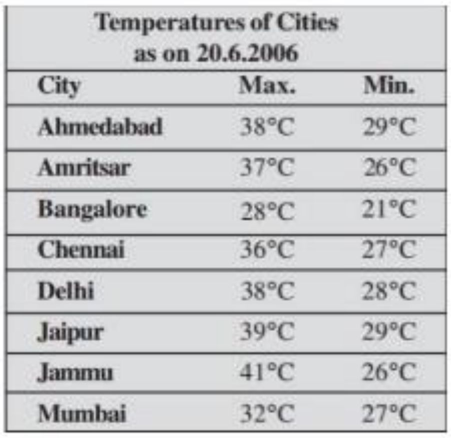
While running the code with different value of r there are different sphere, and we can see that the dimension also changes. Below is the screenshot of 3 sphere in one graph

```
[x y z] = sphere;
a=[3 3 3 3;-3 -3 -3 3;0 4 -2 2];
s1=surf(x*a(1,4)+a(1,1),y*a(1,4)+a(1,2),z*a(1,4)+a(1,3));
hold on
s2=surf(x*a(2,4)+a(2,1),y*a(2,4)+a(2,2),z*a(2,4)+a(2,3));
s3=surf(x*a(3,4)+a(3,1),y*a(3,4)+a(3,2),z*a(3,4)+a(3,3));
daspect([1 1 1])
view(30,10)
```



2.

a. Create an excel sheet consisting the following data :



Temperatures of Cities as on 20.6.2006		
City	Max.	Min.
Ahmedabad	38°C	29°C
Amritsar	37°C	26°C
Bangalore	28°C	21°C
Chennai	36°C	27°C
Delhi	38°C	28°C
Jaipur	39°C	29°C
Jammu	41°C	26°C
Mumbai	32°C	27°C

b. Explore xlsread function using help

c. Read the excel file created in step a) using xlsread function

d. d) Create an M-File and write a script which finds the following:

   i. Compare and identify the city that recorded the max temperature

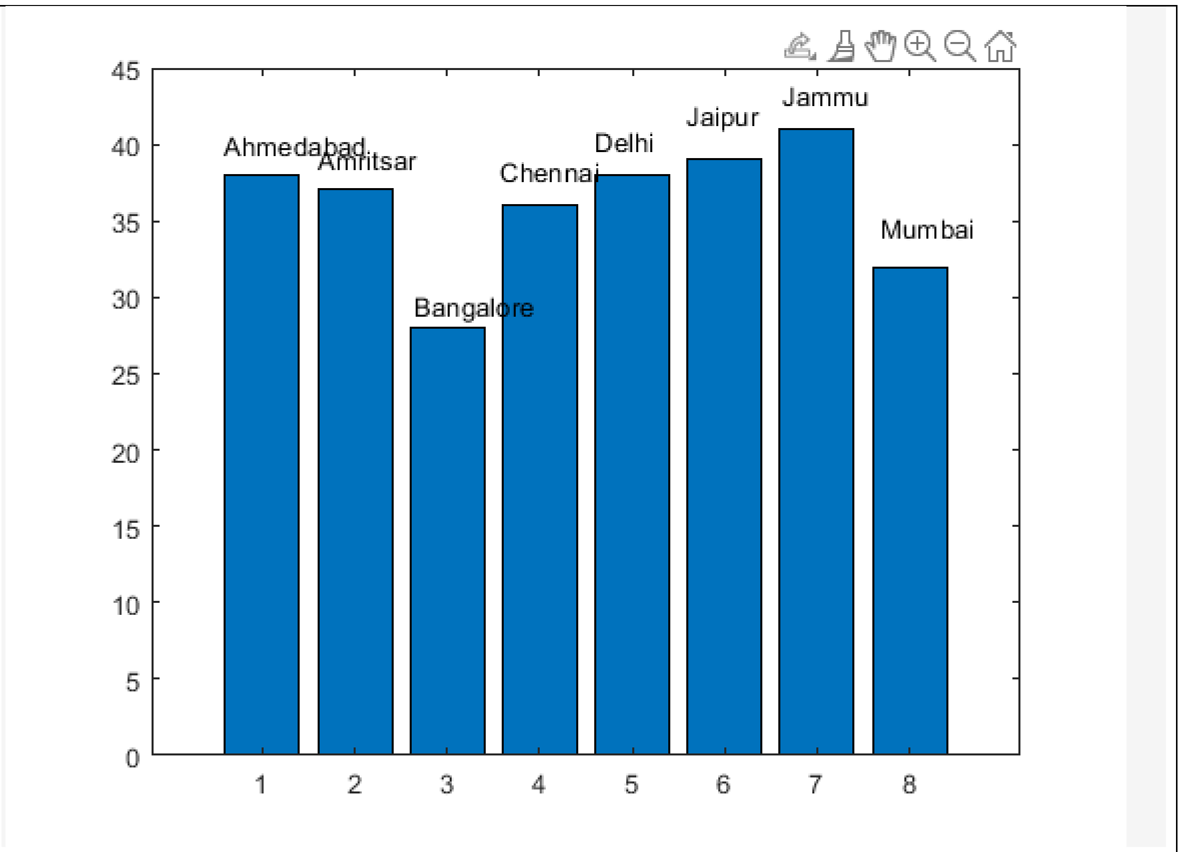
   ii. Plot the given data using bar graph

```
help xlsread

 xlsread Read Microsoft Excel spreadsheet file.

   *** xlsread is not recommended ***
   See readtable, readmatrix, or readcell.

   ----------------------------------------------------
   [NUM,TXT,RAW]=xlsread(FILE) reads data from the first worksheet in the Microsoft
   Excel spreadsheet file named FILE and returns the numeric data in array NUM.
   Optionally, returns the text fields in cell array TXT, and the unprocessed data
   (numbers and text) in cell array RAW.

   [NUM,TXT,RAW]=xlsread(FILE,SHEET) reads the specified worksheet.

   [NUM,TXT,RAW]=xlsread(FILE,SHEET,RANGE) reads from the specified SHEET and RANGE.
   Specify RANGE using the syntax 'C1:C2', where C1 and C2 are opposing corners of
   the region. Not supported for XLS files in BASIC mode.

   [NUM,TXT,RAW]=xlsread(FILE,SHEET,RANGE,'basic') reads from the spreadsheet in
   BASIC mode, the default on systems without Excel for Windows. RANGE is supported
   for XLSX files only.

   [NUM,TXT,RAW]=xlsread(FILE,RANGE) reads data from the specified RANGE of the
   first worksheet in the file. Not supported for XLS files in BASIC mode.

   The following syntaxes are supported only on Windows systems with Excel software:

   [NUM,TXT,RAW]=xlsread(FILE,-1) opens an Excel window to select data
   interactively.
```

```
[NUM,TXT,RAW,CUSTOM]=xlsread(FILE,SHEET,RANGE,'',FUNCTIONHANDLE) reads from the
spreadsheet, executes the function associated with FUNCTIONHANDLE on the data,
and returns the final results. Optionally, returns additional CUSTOM output,
which is the second output from the function. xlsread does not change the data
stored in the spreadsheet.

Input Arguments:

FILE    Name of the file to read. SHEET   Worksheet to read. One of the
        following:
        * The worksheet name.
        * Positive, integer-valued scalar indicating the worksheet
          index.

RANGE   Character vector or string that specifies a rectangular portion of the
        worksheet to read. Not case sensitive. Use Excel A1 reference style. If
        you do not specify a SHEET, RANGE must include both corners and a colon
        character (:), even for a single cell (such as 'D2:D2').

'basic' Flag to request reading in BASIC mode, which is the default for
        systems without Excel for Windows. In BASIC mode, xlsread:
        * Reads XLS, XLSX, XLSM, XLTX, and XLTM files only.
        * Does not support an xlRange input when reading XLS files.
          In this case, use '' in place of xlRange.
        * For XLS files, requires a name to specify the SHEET,
          and the name is case sensitive.
        * Does not support function handle inputs.
        * Imports all dates as Excel serial date numbers. Excel
          serial date numbers use a different reference date than MATLAB date
          numbers.

-1      Flag to open an interactive Excel window for selecting data.
        Select the worksheet, drag and drop the mouse over the range you want,
        and click OK. Supported only on Windows systems with Excel software.

FUNCTIONHANDLE
        Handle to your custom function. When xlsread calls your function, it
        passes a range interface from Excel to provide access to the data. Your
        function must include this interface (of type
        'Interface.Microsoft_Excel_5.0_Object_Library.Range', for example) both
        as an input and output argument.

Notes:

* On Windows systems with Excel software, xlsread reads any file
  format recognized by your version of Excel, including XLS, XLSX, XLSB, XLSM,
  and HTML-based formats.

* If your system does not have Excel for Windows, xlsread operates in
  BASIC mode (see Input Arguments).

* xlsread imports formatted dates as character vectors (such as '10/31/96'),
  except in BASIC mode. In BASIC mode, xlsread imports all dates as serial date
```

```
      numbers. Serial date numbers in Excel use different reference dates than date
      numbers in MATLAB. For information on converting dates, see the documentation
      on importing spreadsheets.

    **********************************
    *** xlsread is not recommended ***
    **********************************

    Compatibility Considerations:
        If the spreadsheet columns are mixed types, but has homogenous
        types along the columns, use READTABLE.

    For reading numeric data, replace the following:
        NUM = xlsread(FILE);

    Instead Use:
        NUM = readmatrix(FILE);

    For reading text data, replace the following:
        [~,TXT] = xlsread(FILE);

    Instead Use:
        TXT = readmatrix(FILE,"OutputType","char");

    When reading RAW data, replace the following:
        [~,~,RAW] = xlsread(FILE);

    Instead Use:
        RAW = readcell(FILE);

    For specifying sheet and range, replace the following:
        ... = xlsread(FILE,SHEET,RANGE);

    Instead use:
        ... = read<type>(FILE,"Sheet",SHEET,"RANGE",RANGE);

    See also readtable, readmatrix, readcell, detectImportOptions

    Documentation for xlsread
```

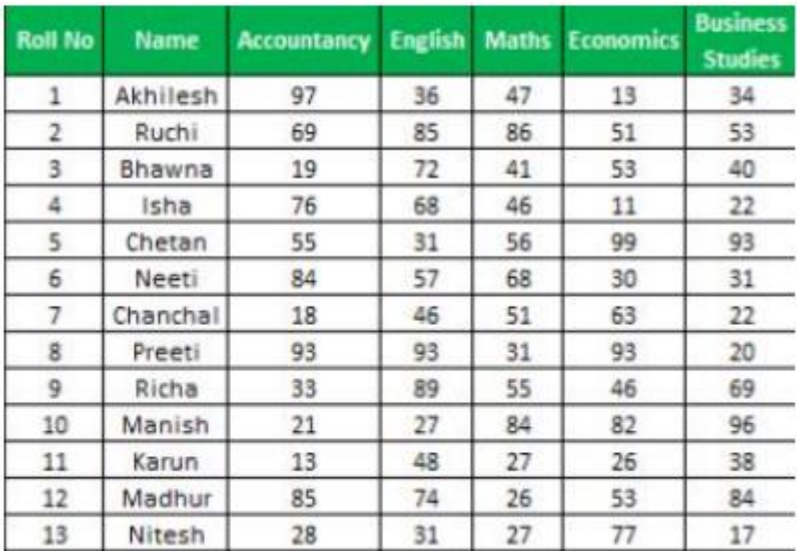
```matlab
data = readtable("Lab_6_1.xlsx");
bar(data.Max)
cont =
char('Ahmedabad','Amritsar','Bangalore','Chennai','Delhi','Jaipur','Jammu',
'Mumbai');
for i = 1:8,
    gtext (cont (i,:));
end
```



<u>**Hence Jammu has recorded the Max Tempreature of 41 Degrees**</u>

3.

a. Create an excel file with the following data:



Roll No	Name	Accountancy	English	Maths	Economics	Business Studies
1	Akhilesh	97	36	47	13	34
2	Ruchi	69	85	86	51	53
3	Bhawna	19	72	41	53	40
4	Isha	76	68	46	11	22
5	Chetan	55	31	56	99	93
6	Neeti	84	57	68	30	31
7	Chanchal	18	46	51	63	22
8	Preeti	93	93	31	93	20
9	Richa	33	89	55	46	69
10	Manish	21	27	84	82	96
11	Karun	13	48	27	26	38
12	Madhur	85	74	26	53	84
13	Nitesh	28	31	27	77	17

b. Read the file in matlab using xlsread

c. Create a function tot_marks to calculate total marks of each Student.

d. Create function avg to calculate average marks of each student.

e. Plot the marks obtained in step c. using

```
data_1 = readtable("Lab_6_2.xlsx")
```

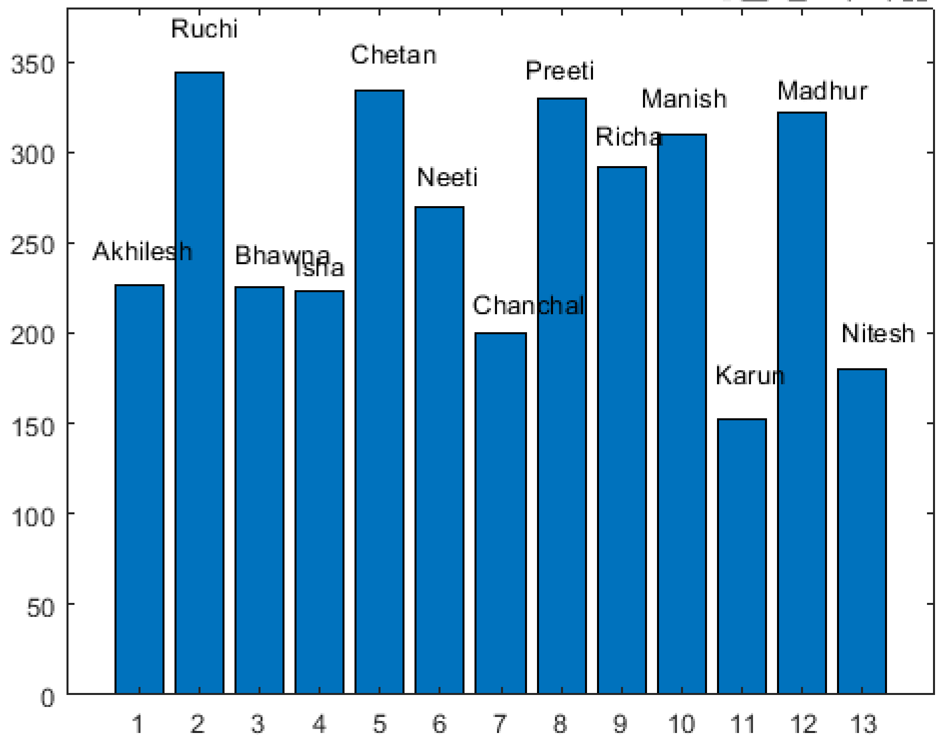
```
Warning: Column headers from the file were modified to make them valid MATLAB
identifiers before creating variable names for the table. The original column headers
are saved in the VariableDescriptions property.
Set 'VariableNamingRule' to 'preserve' to use the original column headers as table
variable names.
```

```
data_1 = 13×7 table
```

	RollNo	Name	Accountancy	English	Maths	Economics	BusinessStudies
1	1	'Akhilesh'	97	36	47	13	34
2	2	'Ruchi'	69	85	86	51	53
3	3	'Bhawna'	19	72	41	53	40
4	4	'Isha'	76	68	46	11	22
5	5	'Chetan'	55	31	56	99	93
6	6	'Neeti'	84	57	68	30	31
7	7	'Chanchal'	18	46	51	63	22
8	8	'Preeti'	93	93	31	93	20
9	9	'Richa'	33	89	55	46	69
10	10	'Manish'	21	27	84	82	96
11	11	'Karun'	13	48	27	26	38
12	12	'Madhur'	85	74	26	53	84
13	13	'Nitesh'	28	31	27	77	17

```
vars = ["Accountancy","English","Maths","Economics","BusinessStudies"];
data_1.TestMean = sum(data_1{:,vars},2);
bar(data_1.TestMean)
cont = char('Akhilesh','Ruchi','Bhawna','Isha','Chetan',...

'Neeti','Chanchal','Preeti','Richa','Manish','Karun','Madhur','Nitesh');
ylim([0 380])
for i = 1:13,
    gtext (cont (i,:));
```

```
end
```



```
data_1.Average = mean(data_1{:,vars},2)
```

```
data_1 = 13×9 table
```

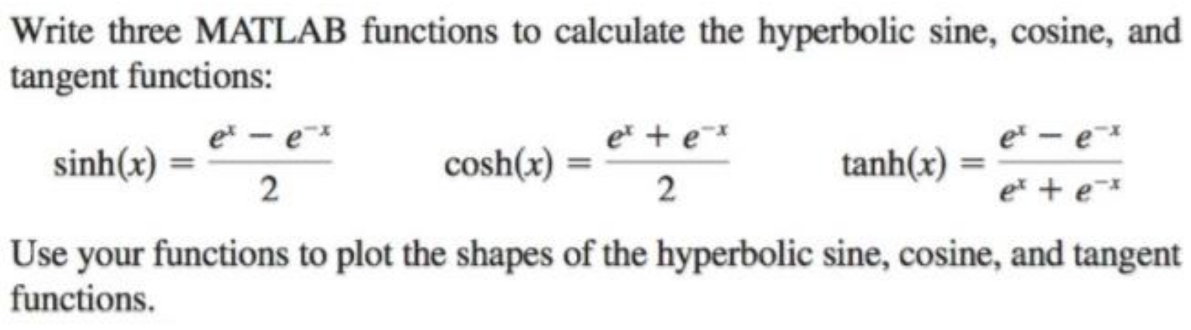
	RollNo	Name	Accountancy	English	Maths	Economics	BusinessStudies	TestMean	Average
1	1	'Akhilesh'	97	36	47	13	34	227	45.4000
2	2	'Ruchi'	69	85	86	51	53	344	68.8000
3	3	'Bhawna'	19	72	41	53	40	225	45
4	4	'Isha'	76	68	46	11	22	223	44.6000
5	5	'Chetan'	55	31	56	99	93	334	66.8000
6	6	'Neeti'	84	57	68	30	31	270	54
7	7	'Chanchal'	18	46	51	63	22	200	40
8	8	'Preeti'	93	93	31	93	20	330	66

9	9	'Richa'	33	89	55	46	69	292	58.4000
10	10	'Manish'	21	27	84	82	96	310	62
11	11	'Karun'	13	48	27	26	38	152	30.4000
12	12	'Madhur'	85	74	26	53	84	322	64.4000
13	13	'Nitesh'	28	31	27	77	17	180	36

Roll No.: A016	Name: Varun Khadayate
Class: B. Tech CsBs	Batch: 1
Date of Experiment: 18-09-2022	Subject: ITWS

Lab 7: M-script file-extended

1.

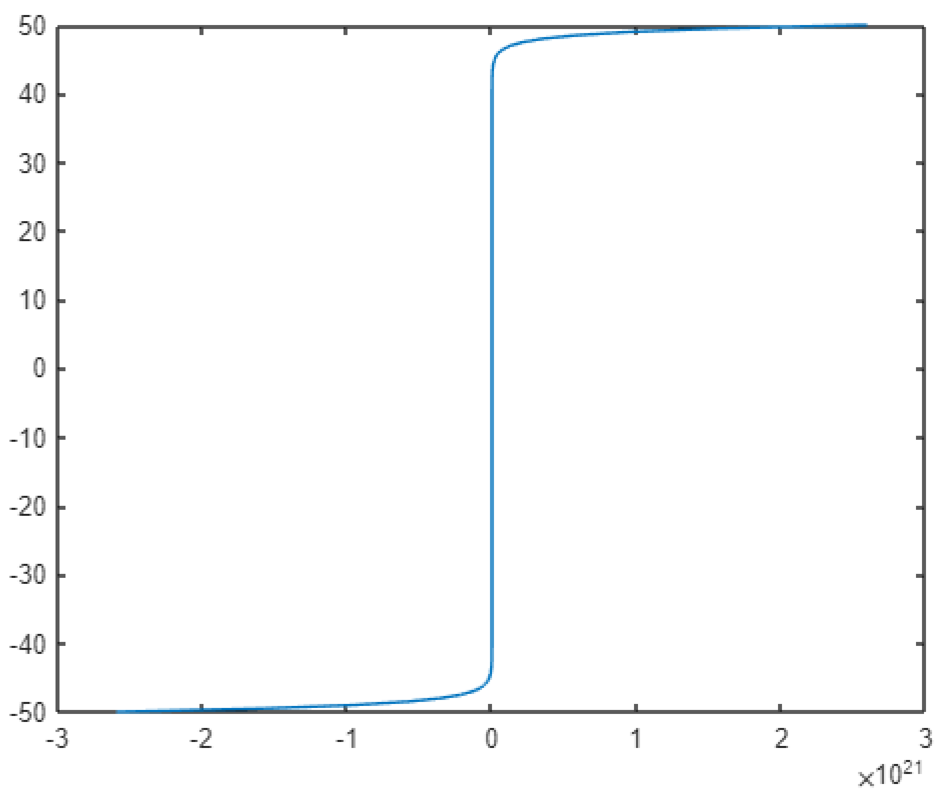


Write three MATLAB functions to calculate the hyperbolic sine, cosine, and tangent functions:

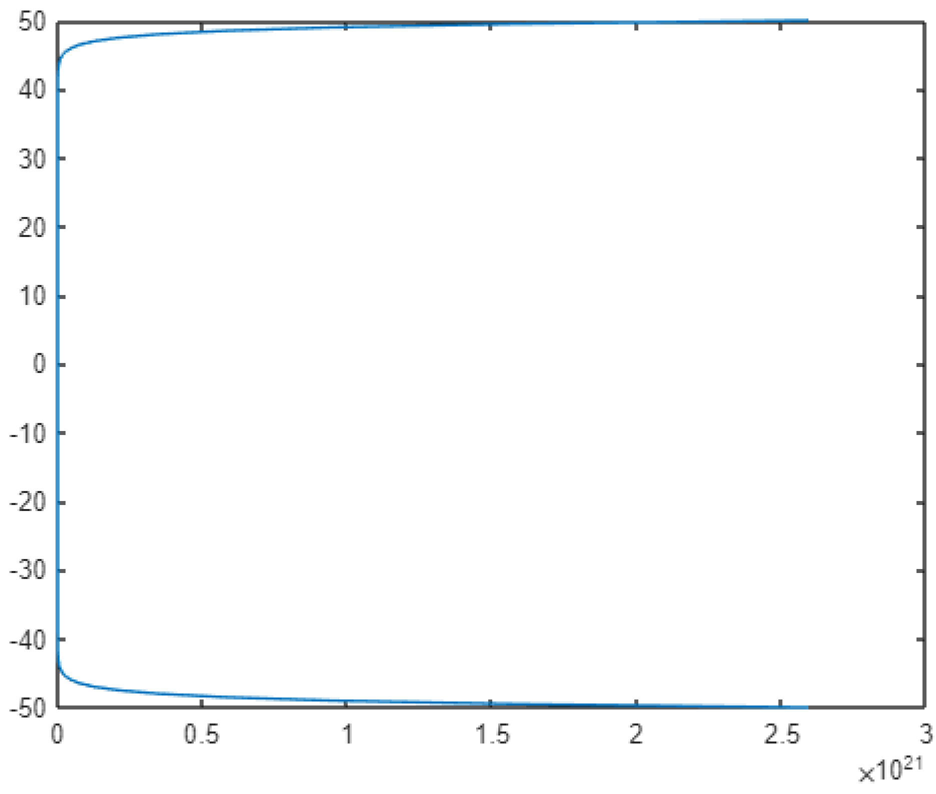
$$\sinh(x) = \frac{e^x - e^{-x}}{2} \qquad \cosh(x) = \frac{e^x + e^{-x}}{2} \qquad \tanh(x) = \frac{e^x - e^{-x}}{e^x + e^{-x}}$$

Use your functions to plot the shapes of the hyperbolic sine, cosine, and tangent functions.

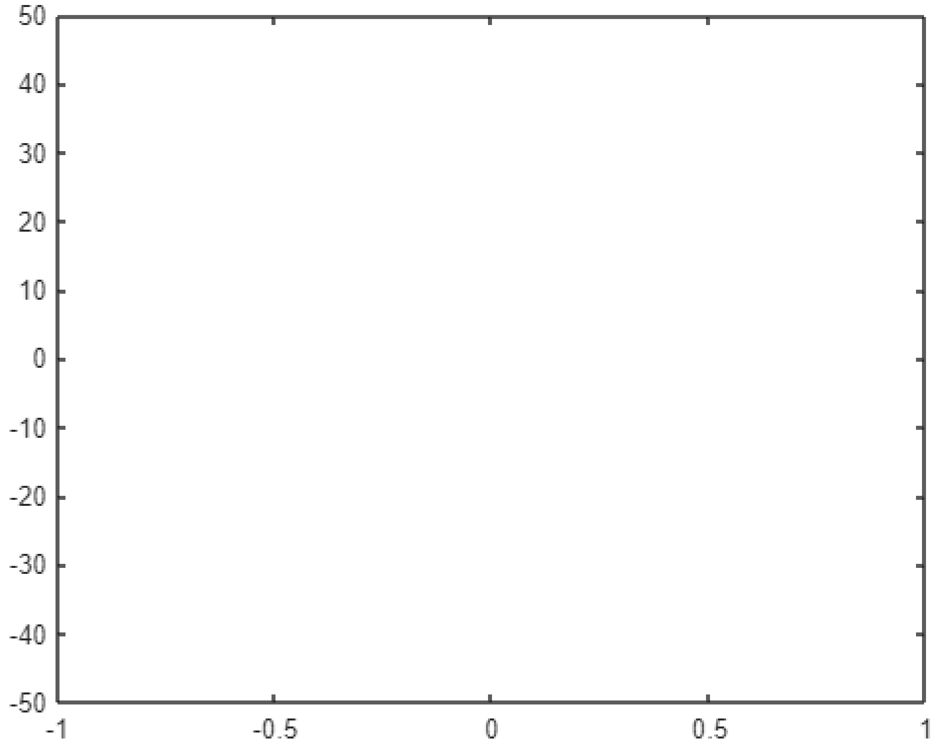
```
x = linspace(-50,50,200) ;
y_sinh = (exp(x) - exp(-x))/2;
figure;
plot(y_sinh,x);
```



```
x = linspace(-50,50,200) ;
y_cosh = (exp(x) + exp(-x))/2;
figure;
plot(y_cosh,x);
```



```
x = linspace(-50,50,200) ;
y_tanh = (exp(x) - exp(-x))/(exp(x) + exp(-x));
figure;
plot(y_tanh,x);
```



2.

The gravitational force F between two bodies of masses and is given by the equation

$$F = \frac{Gm_1m_2}{r^2}$$

where G is the gravitation constant (6.672 x 10^{11} N m^2 / kg^2), and are the masses of the bodies in kilograms, and r is the distance between the two bodies. Write a function to calculate the gravitational force between two bodies given their masses and the distance between them. Test you function by determining the force on an 800 kg satellite in orbit 38,000 km above the Earth. (The mass of the Earth is 5.98 x 10^{24} kg.)3

```
m1 = 800;
m2 = 5.98E24;
r = 38000;
G = 6.672E-11;
force = G * m1 * m2 / r^2
```

Ouput

```
force = 2.2104e+08
```

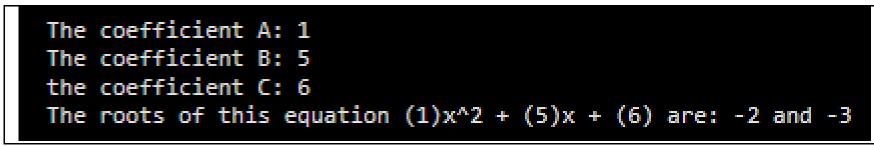
3.

a) Write a program that will solve for the roots of a quadratic equation and display the answer on the screen. The inputs required by this program are the coefficients a,b and c (to be taken from the user) of the quadratic equation (ax 2+bx+c = 0)

```
a = input ('Enter the coefficient A: ');

b = input ('Enter the coefficient B: ');

c = input ('Enter the coefficient C: ');

d = b^2 - 4 * a * c;

x1 = ( -b + sqrt(d) ) / ( 2 * a );

x2 = ( -b - sqrt(d) ) / ( 2 * a );

fprintf(['The coefficient A: %d \n' ...

    'The coefficient B: %d\n'...

    'the coefficient C: %d\n'...

    'The roots of this equation (%d)x^2 + (%d)x + (%d) are: %d and
%d'],a,b,c,a,b,c,x1,x2);
```

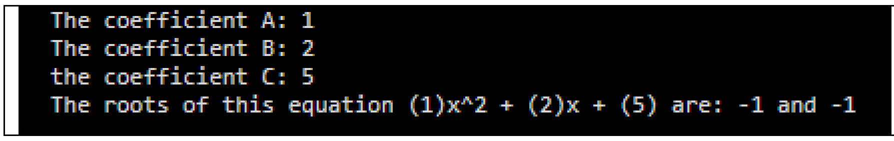
b) Test the program for :

i. $x^2+5x+6 = 0$



```
The coefficient A: 1
The coefficient B: 5
the coefficient C: 6
The roots of this equation (1)x^2 + (5)x + (6) are: -2 and -3
```

ii. $x^2+2x+5 = 0$



```
The coefficient A: 1
The coefficient B: 2
the coefficient C: 5
The roots of this equation (1)x^2 + (2)x + (5) are: -1 and -1
```

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Class: B. Tech CsBs	Batch: 1
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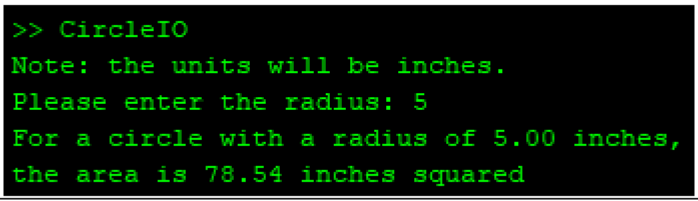
Lab 8

CircleIO.m

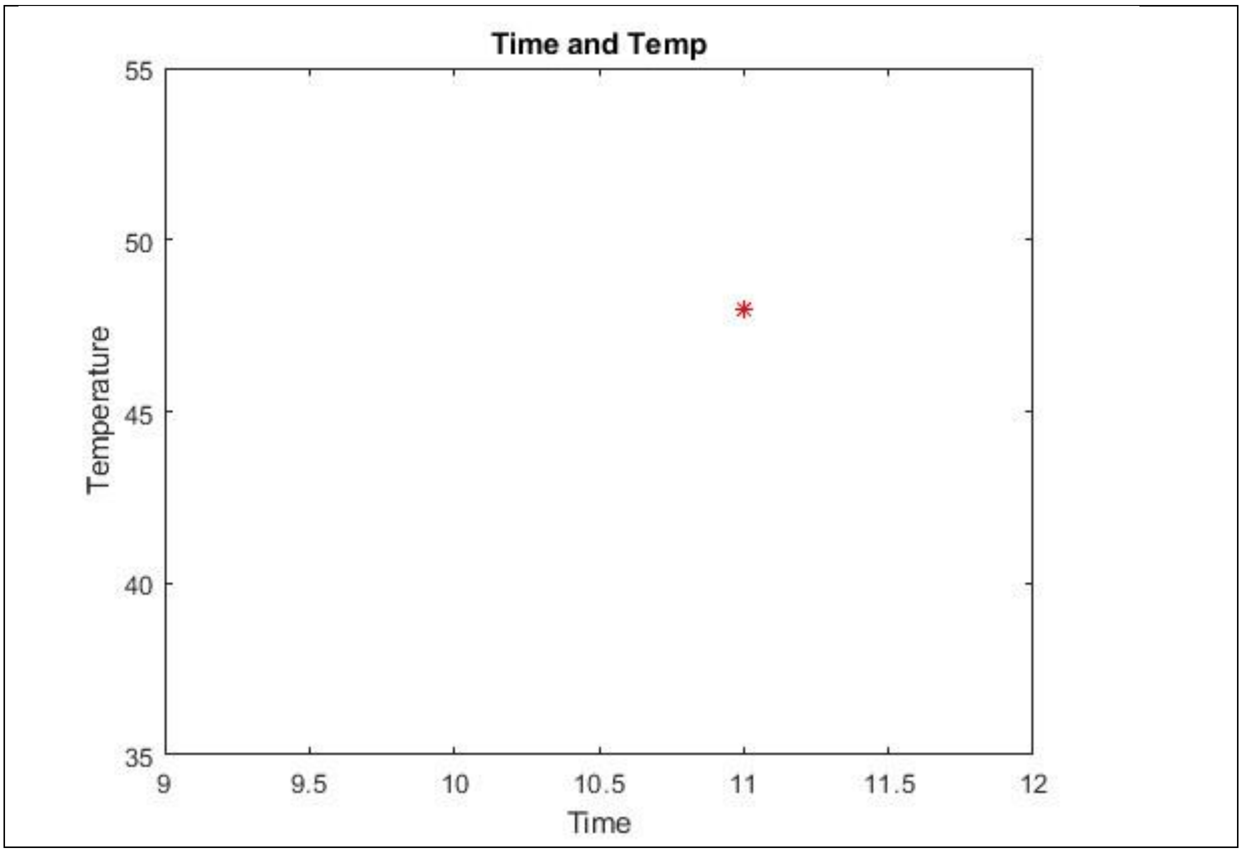
```
% This script calculates the area of a circle
% It prompts the user for the radius

%Prompt the user for the radius and calculate the area based on that radius
fprintf('Note: the units will be inches. \n')
radius = input('Please enter the radius: ');
area = pi * (radius ^2) ;

%Print all variables in a sentence format
fprintf('For a circle with a radius of %.2f inches, \n' ,radius)
fprintf('the area is %.2f inches squared \n' , area)
```



```
>> CircleIO
Note: the units will be inches.
Please enter the radius: 5
For a circle with a radius of 5.00 inches,
the area is 78.54 inches squared
```

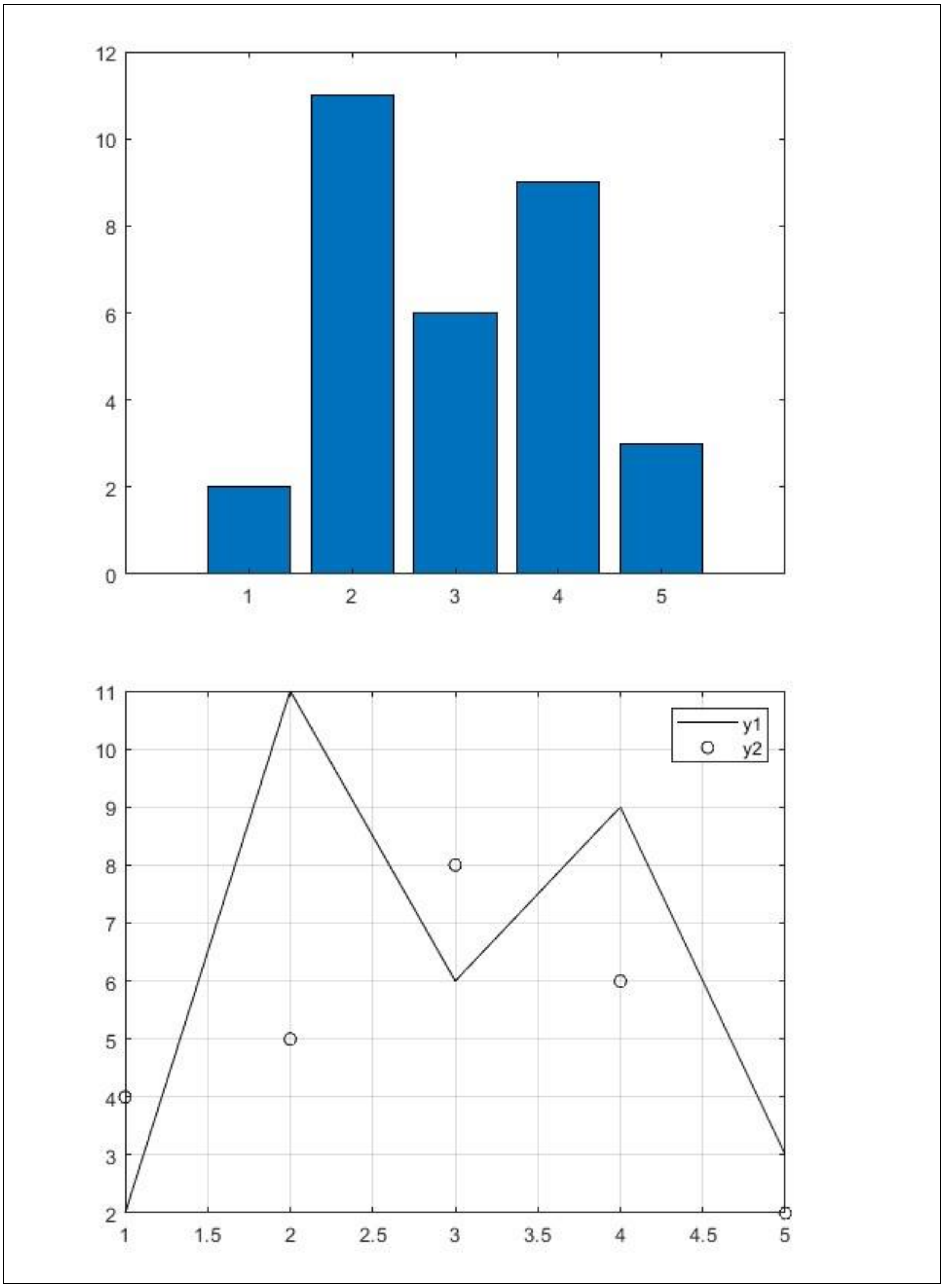
plotonepoint.m

```
%  This is a really simple plot of just one point !
%  Create coordinate variables and plot a red ' *
x = 11;
y = 48;

plot(x, y, 'r*')
%  Change the axes and label them
axis([9 12 35 55])
xlabel('Time')
ylabel('Temperature')
%  Put a title on the plot
title('Time and Temp')
```



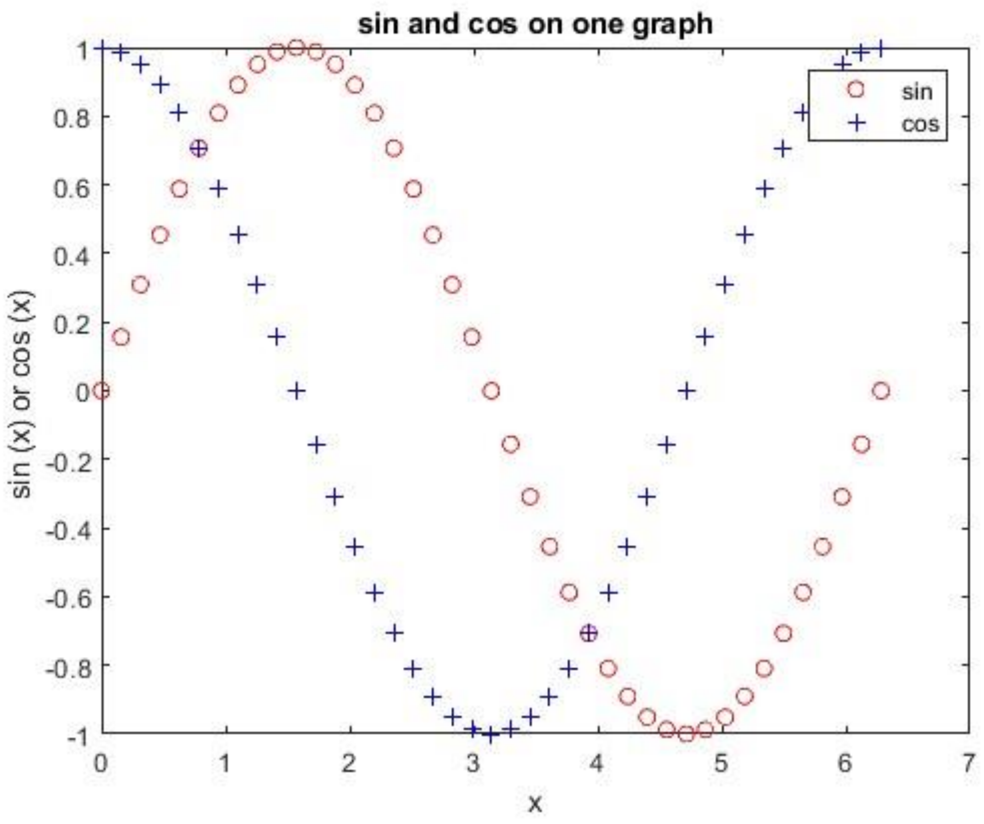
plot2figs.m

```
% This creates 2 different plots, in 2 different
% Figure Windows, to demonstrate some plot features
clf

x = 1:5; % Not necessary
y1 = [2 11 6 9 3] ;
y2 = [4 5 8 6 2] ;
%  Put a bar chart in Figure 1

figure (1)
bar (x, y1)
%  Put plots using different y values on one plot with a legend
figure (2)

plot (x, y1, 'k')
hold on
plot (x, y2, 'ko' )
grid on
legend ( 'y1' , 'y2')
```


0
2
4
6
8
10
12
1
2
3
4
5
2
3
4
5
6
7
8
9
10
11
1
1.5
2
2.5
3
3.5
4
4.5
5
y1
y2

sinncos.m

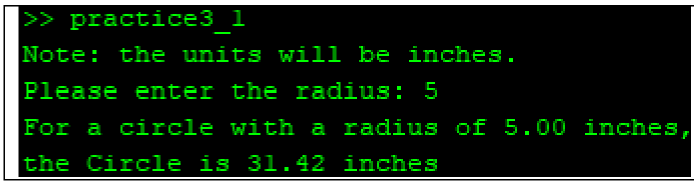
```
% takes the character and the number and prints them
a=input('Enter a character--->','s');
n=input('Enter a number--->');
% display the character in a field width of 3.
fprintf('%3c',a);
fprintf('\n')
% display the left-justified number in a field width of 8 with 3 decimal places.
fprintf('%-8.3f\n',n);
```



Practice 3.1

Write a script to calculate the circumference of a circle (C=2 πr). Comment the script.

```
% This script calculates the circumference of a circle
% It prompts the user for the radius

%Prompt the user for the radius and calculate the area based on that radius
fprintf('Note: the units will be inches. \n')
radius = input('Please enter the radius: ');
area = 2 * pi * radius ;

%Print all variables in a sentence format
fprintf('For a circle with a radius of %.2f inches, \n' ,radius)
fprintf('the Circle is %.2f inches \n' , area)
```



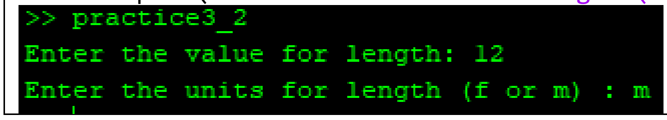
```
>> practice3_1
Note: the units will be inches.
Please enter the radius: 5
For a circle with a radius of 5.00 inches,
the Circle is 31.42 inches
```

Practice 3.2

Create a script that would prompt the user for a length, and then 'f' for feet or 'm' for meters, and store both inputs in variables. For example, when executed it would look like this (assuming the user enters 12.3 and then m):

```
Enter the length: 12.3
Is that f(eet)or m(eters)?: m
```

```
% This script records the length and the unit of that length
% It prompts the user for the radius

%  Promts the user for values and stores them
length=input ( 'Enter the value for length: ') ;
units=input ( 'Enter the units for length (f or m) : ', 's');
```

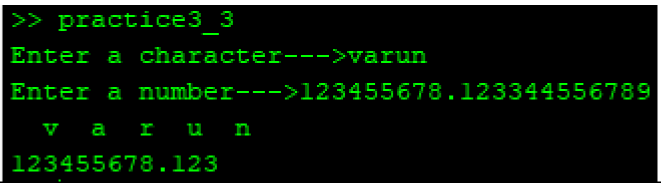


```
>> practice3_2
Enter the value for length: 12
Enter the units for length (f or m) : m
```

Practice 3.3

Write a script to prompt the user separately for a character and a number, and print the character in a field width of 3 and the number left-justified in a field width of 8 with 3 decimal places. Test this by entering numbers with varying widths.

```
% takes the character and the number and prints them
a=input('Enter a character--->','s');
n=input('Enter a number--->');
% display the character in a field width of 3.
fprintf('%3c',a);
fprintf('\n')
% display the left-justified number in a field width of 8 with 3 decimal places.
fprintf('%-8.3f\n',n);
```

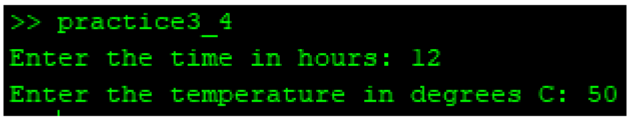


```
>> practice3_3
Enter a character--->varun
Enter a number--->123455678.123344556789
  v  a  r  u  n
123455678.123
```

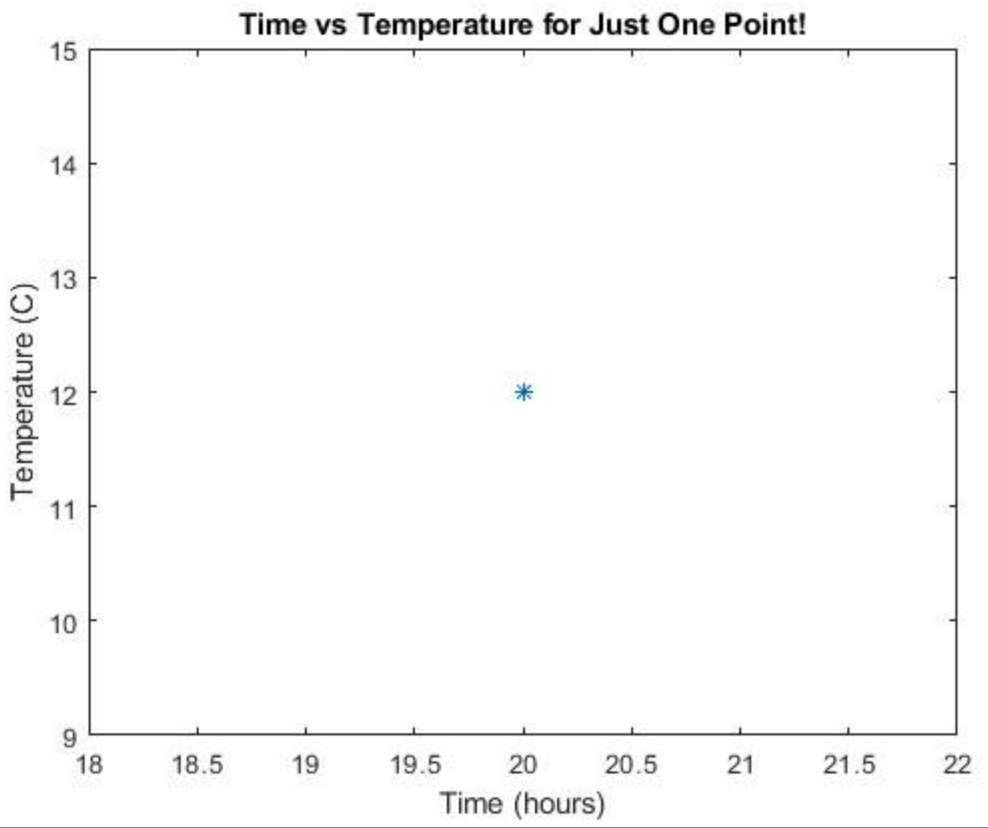
Practice 3.4

Modify the script *plotonepoint* to prompt the user for the time and temperature, and set the axes based on these values.

```
% This script plots one point (time, temp) from data
% acquired from the user.
% Ask the user for the data to plot and store in the
% variables time and temp
time = input('Enter the time in hours: ');

temp = input('Enter the temperature in degrees C: ');
plot(time,temp,"*")

% Adjust the x and y axis limits

axis([time-2 time+2 temp-3 temp+3]);

% Label the axis
xlabel("Time (hours)")

ylabel("Temperature (C)")
% Add a title
title("Time vs Temperature for Just One Point!")
```



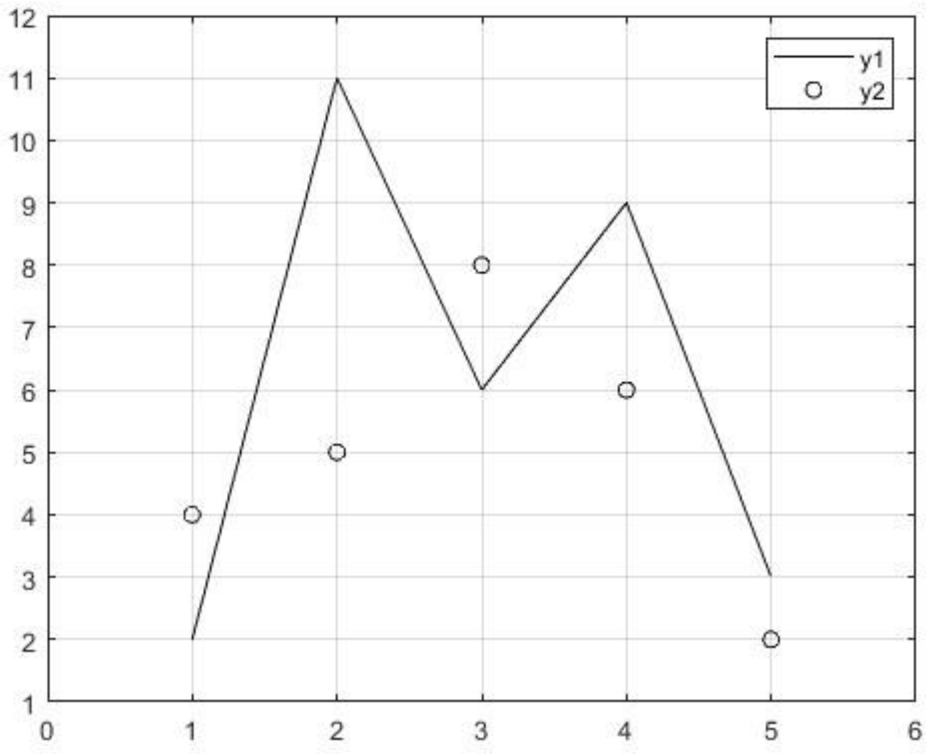
```
>> practice3_4
Enter the time in hours: 12
Enter the temperature in degrees C: 50
```

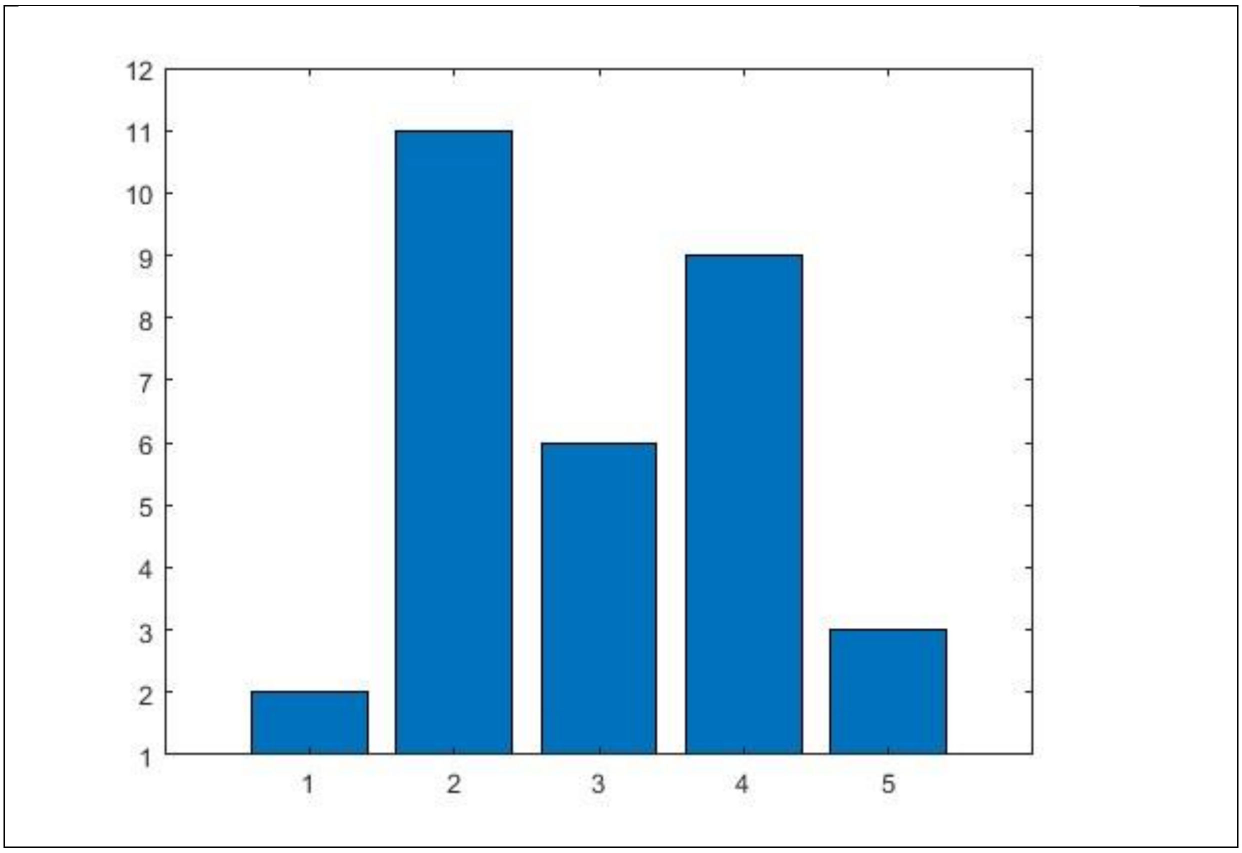


Practice3.5

Modify the *plot2figs* script using the **axis** function so that all points are easily seen.

```
% creates two different plots
x=1:5;
y1=[2 11 6 9 3];

y2=[4 5 8 6 2];
%Put a bar chart in Figure 1
figure(1)
bar(x,y1)
%Change the axis settings
axis([0 6 1 12]);
%Put plots using different y values on one plot with a legend
figure(2)
plot(x,y1,"k")
hold on
plot(x,y2,'ko')
grid on
legend( 'y1', 'y2')
%Change the axis settings
axis([0 6 1 12]);
```

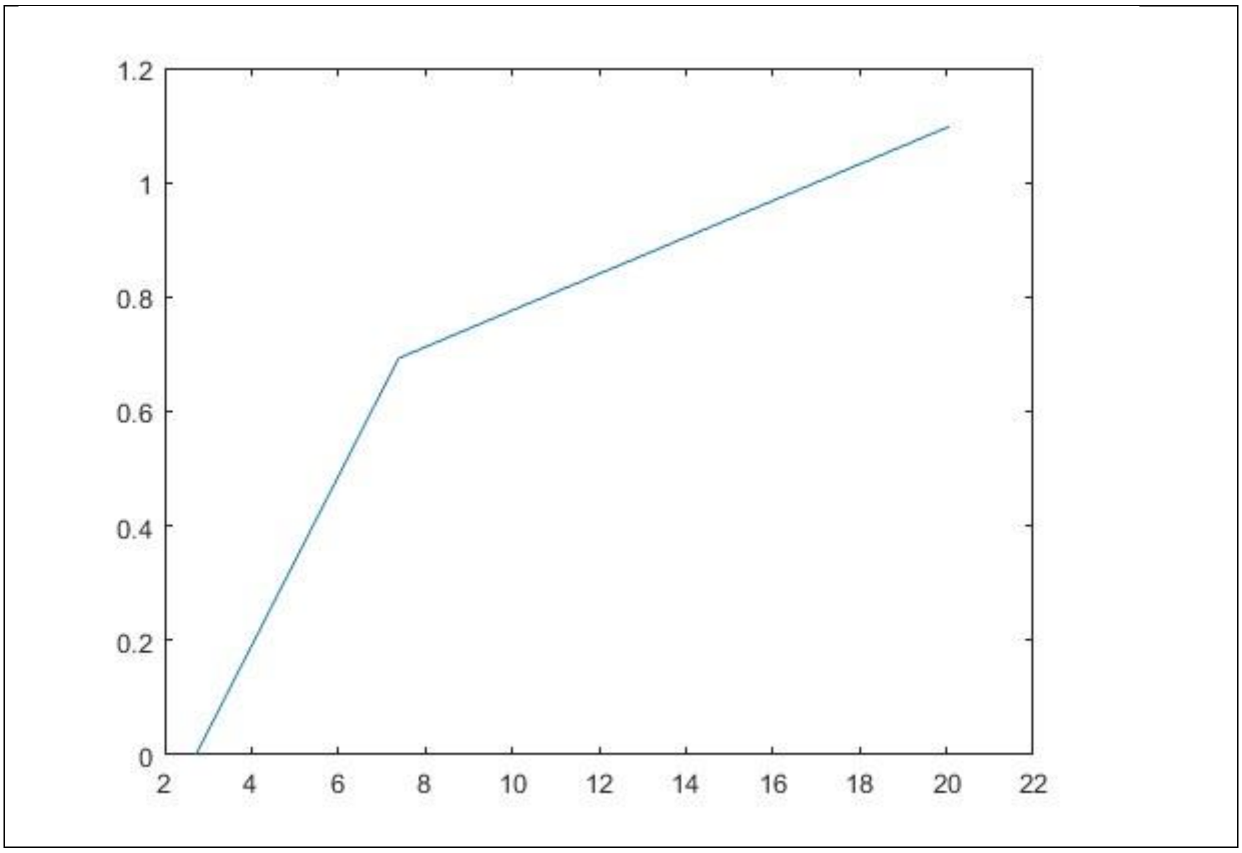




Practice 3.6

Write a script that plots exp(x) and log(x) for values of x ranging from 0 to 3.5.

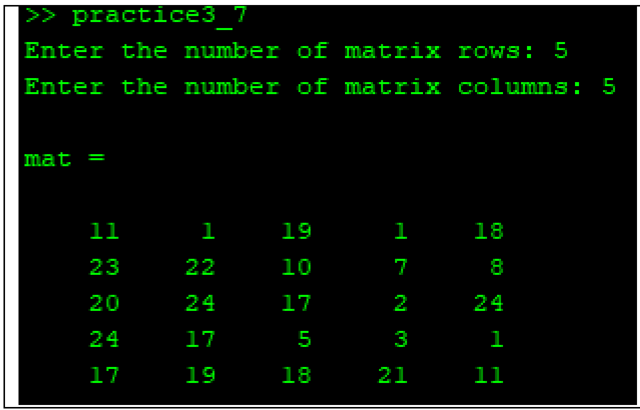
```
x = 0:3.5;
plot(exp(x),log(x))
```



Practice 3.7

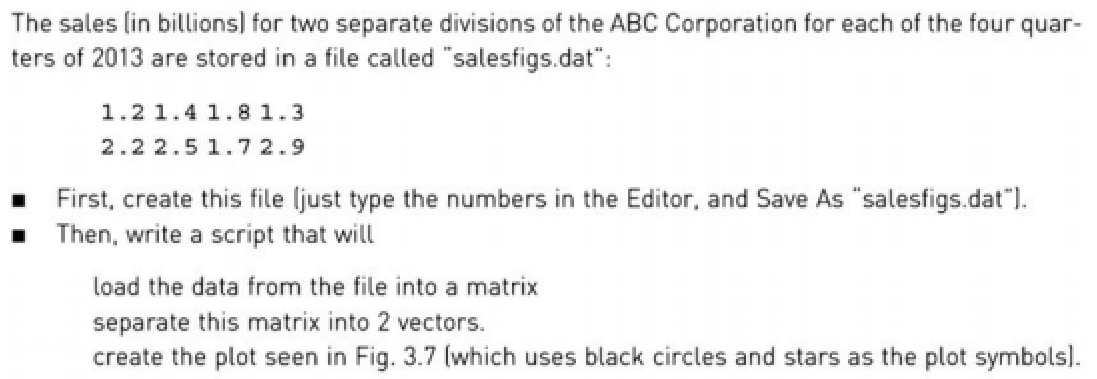
Prompt the user for the number of rows and columns of a matrix, create a matrix with that many rows and columns of random integers, and write it to a file.

```
% This script asks for user input for the number of rows
% and columns for a matrix. Then a matrix of that size is
% filled with random numbers and save in ASCII format to a

% file.
% Ask user for input
row = input('Enter the number of matrix rows: ');
col = input('Enter the number of matrix columns: ');

% Create the matrix of random numbers of specified size.
mat = randi(25, row,col)
% Save the matrix as an ASCII file.
save myMatrix.dat mat -ascii
```



```
>> practice3_7
Enter the number of matrix rows: 5
Enter the number of matrix columns: 5

mat =

    11     1    19     1    18
    23    22    10     7     8
    20    24    17     2    24
    24    17     5     3     1
    17    19    18    21    11
```

Practice 3.8

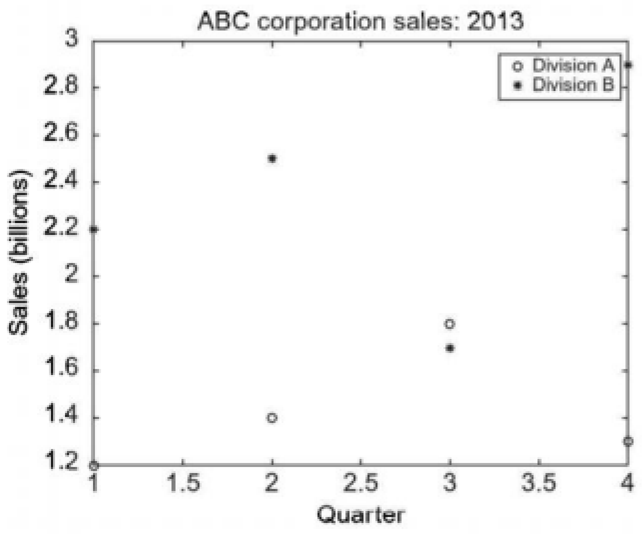


The sales (in billions) for two separate divisions of the ABC Corporation for each of the four quarters of 2013 are stored in a file called "salesfigs.dat":

```
1.2 1.4 1.8 1.3
2.2 2.5 1.7 2.9
```

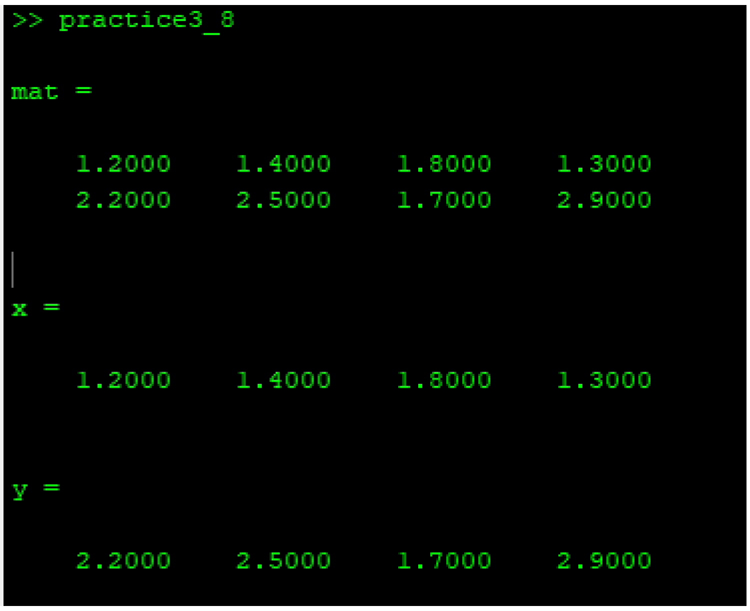
- First, create this file (just type the numbers in the Editor, and Save As "salesfigs.dat").
- Then, write a script that will

  load the data from the file into a matrix
  separate this matrix into 2 vectors.
  create the plot seen in Fig. 3.7 (which uses black circles and stars as the plot symbols).

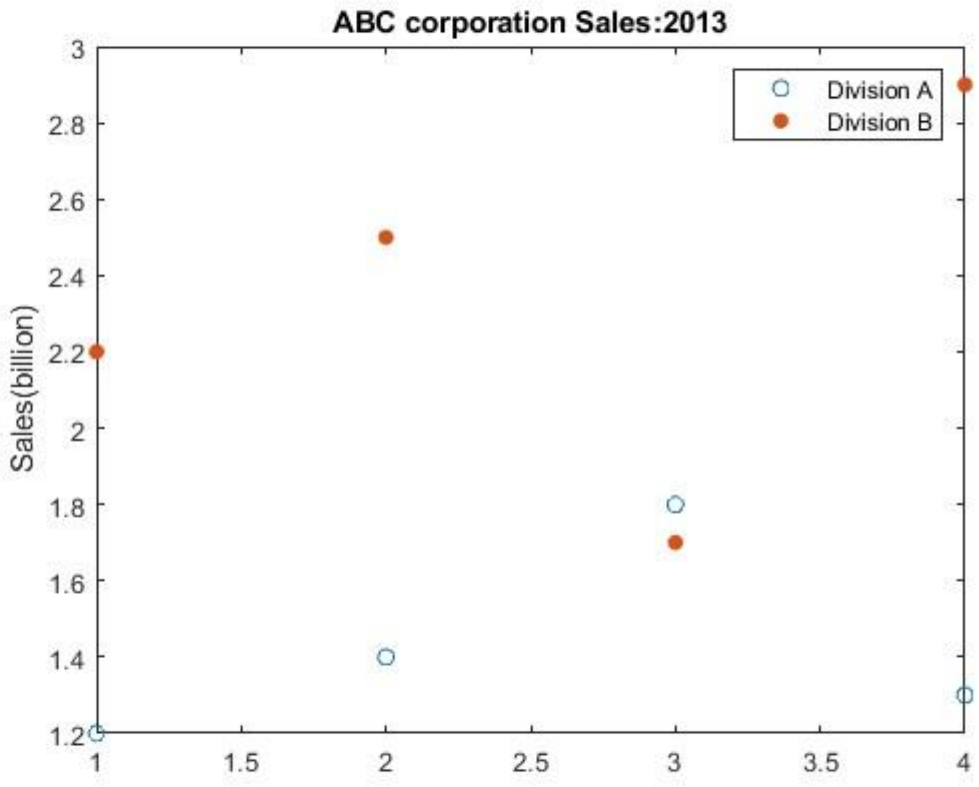


```
row = [1.2 1.4 1.8 1.3];
col = [2.2 2.5 1.7 2.9];
mat = [row;col]
% Save the matrix as an ASCII file.
save salesfigs.dat mat -ascii
% Load .dat file
load salesfigs.dat
x=salesfigs(1,:)
y=salesfigs(2,:)
```

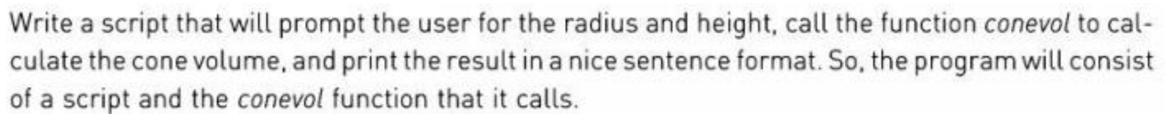
```
plot(1:numel(x),x,'o')
hold on
plot(1:numel(y),y,'.','MarkerSize',20)
ylabel('Sales(billion)')
title('ABC corporation Sales:2013')
legend('Division A','Division B')
hold off
```



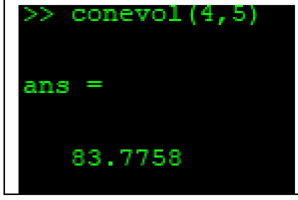
```
>> practice3_8

mat =

    1.2000    1.4000    1.8000    1.3000
    2.2000    2.5000    1.7000    2.9000


x =

    1.2000    1.4000    1.8000    1.3000


y =

    2.2000    2.5000    1.7000    2.9000
```



Practice 3.9

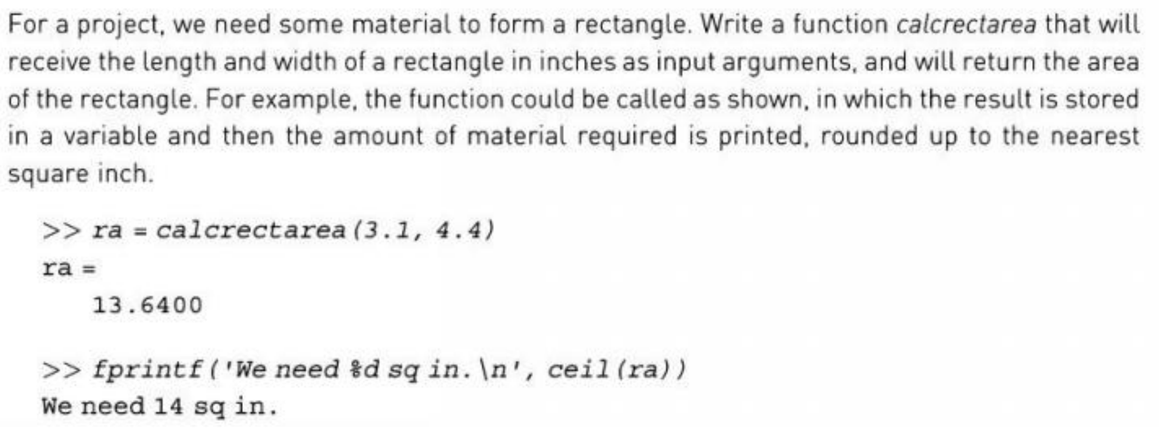

Write a script that will prompt the user for the radius and height, call the function *conevol* to calculate the cone volume, and print the result in a nice sentence format. So, the program will consist of a script and the *conevol* function that it calls.

```
function [ V ] = conevol( r,h )
% CONEVOL finds the volume of a cone
% Format of call: conevol(r,h)

% Returns cone volume
V = pi * r^2 * h/3;
end
```



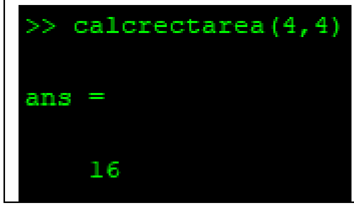
```
>> conevol(4,5)

ans =

   83.7758
```

Practice 3.10


For a project, we need some material to form a rectangle. Write a function *calcrectarea* that will receive the length and width of a rectangle in inches as input arguments, and will return the area of the rectangle. For example, the function could be called as shown, in which the result is stored in a variable and then the amount of material required is printed, rounded up to the nearest square inch.

```
>> ra = calcrectarea(3.1, 4.4)
ra =
    13.6400

>> fprintf('We need %d sq in.\n', ceil(ra))
We need 14 sq in.
```

```
function [ A ] = calcrectarea( L,W )
% CALRECTAREA Finds the area of a rectangle rounded up to
% the nearest integer.
% Format of call: calRectArea(L,W)
% Returns rectangle area rounded up to the nearest integer
% Compute the area and round the result up to the nearest integer.
A = ceil( L * W );
end
```



```
>> calcrectarea(4,4)

ans =

    16
```

Lab 9: If-Else statement

1. Whether a storm is a tropical depression, tropical storm, or hurricaneis determined by the average sustained wind speed. In miles per hour, a storm is a tropical depression if the winds are less than 38 mph. It is a tropicalstorm if the winds are between 39 and 73 mph, and it is a hurricaneif the wind speeds are >= 74 mph. Write a script that will prompt the user for the wind speed of the storm, and will print which type of storm it is.

```
% Prints whether a storm is a tropical depression,
% tropical storm, or hurricane based on wind speed

wind = input('Enter the wind speed of the storm: ');
if wind < 38
    disp('Tropical depression')
elseif wind >= 38 && wind < 73
    disp('Tropical storm')
else
    disp('Hurricane')
end
```

```
Tropical storm
```

2. In aerodynamics, the Mach number is a critical quantity. It is defined as the ratio of the speed of an object (e.g., an aircraft) to the speed of sound. If theMach number is less than 1, the flow is subsonic; if the Mach number is equal to 1, the flow is transonic; if the Mach number is greater than 1, the flow is supersonic. Write a script that will prompt the user for the speed of an aircraft and the speed of sound at the aircraft's current altitude and will print whether the condition is subsonic, transonic, or supersonic.

```
% Prints whether the speed of an object is subsonic,
% transonic, or supersonic based on the Mach number

plane_speed = input('Enter the speed of the aircraft: ');
sound_speed = input('Enter the speed of sound: ');
mach = plane_speed/sound_speed;

if mach < 1
disp('Subsonic')
elseif mach == 1
disp('Transonic')
else
    disp('Supersonic')
end
```

```
Supersonic
```

3. In a script, the user is supposed to enter either a 'y' or 'n' in responseto a prompt. The user's input is read into acharacter variable called "letter". The script will print "OK, continuing" if the user enters either a 'y' or 'Y' or it will print "OK, halting" if the user enters a 'n' or 'N' or "Error" if the user enters anythingelse. Put this statement in the scriptfirst:

```
letter = input('Enter your answer: ', 's');
```

Write the scriptusing a singlenested if-else statement (elseif clause is permitted).

```
% Prompts the user for a 'y' or 'n' answer and responds
% accordingly, using an if-else statement
letter = input('Enter your answer: ', 's');
if letter == 'y' || letter == 'Y'
disp('OK, continuing')
elseif letter == 'n' || letter == 'N'
    disp('OK, halting')
else
    disp('Error')
end
```

```
OK, continuing
```

4. Write a function *flipvec* that will receive one input argument. If the input argument is a row vector, the function will reverse the order and returna new row vector. If the input argument is a columnvector, the function will reversethe order and return a new column vector. If the input argument is a matrixor a scalar, the function will return the input argument unchanged.

```
% function out = flipvec(vec)
% % Flips it if it's a vector, otherwise
% % returns the input argument unchanged
% % Format of call: flipvec(vec)
% % Returns flipped vector or unchanged
% [r, c] = size(vec);
% if r == 1 && c > 1
%     out = fliplr(vec);
% elseif c == 1 && r > 1
%     out = flipud(vec);
% else
%     out = vec;
% end
% end

% flipvec([1 2 3 4 5])
%
% ans =
%
```

```
%      5     4     3     2     1
%
% flipvec([1; 2; 3; 4; 5])
%
% ans =
%
%      5
%      4
%      3
%      2
%      1
```

5. Write a function *eqfn* thatwill calculate $f(x) = x^2 + \frac{1}{x}$ for all elementsof x. Since divisionby 0 is not possible, if any element in x is zero, the function will instead return a flag of -99.

```
% function fofx = eqfn(x)
% if any(any(x==0))
%     fofx = -99;
% else
%     fofx = x.^2 + 1./x;
% end
% end

% eqfn(5)
%
% ans =
%
%    25.2000
```

for-end loop

6. In the Command Window, write a for loop that will iterate through the integers from 32 to 255. For each, show the corresponding character from the character encoding. Play with this! Try printing characters beyond the standard ASCII, in small groups. For example, print the characters that correspond to integers from 300 to 340.

```
for i = 32:255
    disp(char(i))
end
```

```

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#
$
%
```

```
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```
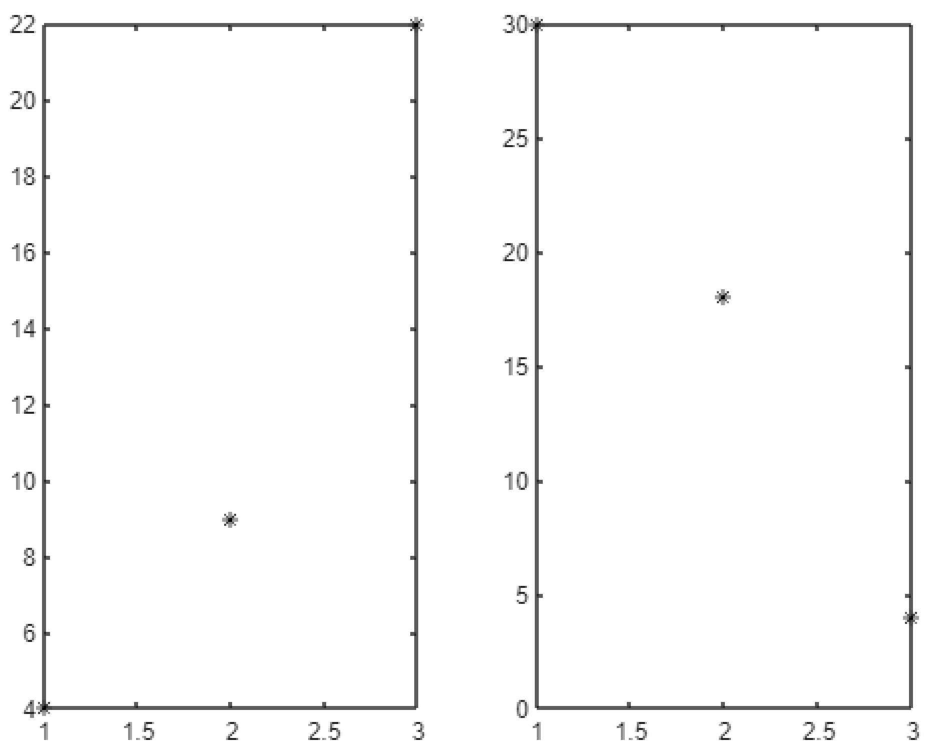

7. Write a function *sumsteps2* that calculates and returns the sum of 1 to *n* in steps of 2, where *n* isan argument passedto the function. For example,if 11 is passed, it will return1 + 3 + 5 + 7 + 9 + 11. Do this using a for loop. Calling the functionwill look like this:

```
>> sumsteps2(11)

ans = 36
```

```
% function outsum = sumsteps2(n)
% % sum from 1 to n in steps of 2
% % Format of call: sumsteps2(n)
% % Returns 1 + 3 + ... + n
%
% outsum = 0;
% for i = 1:2:n
%     outsum = outsum + i;
% end
% end

% sumsteps2(18)
%
% ans =
%
%     81
```

8. Write a script that will load data from a file into a matrix. Createthe data file first, and make sure that there is the same number of values on every line in the file so that it can be loaded into a matrix. Using a <u>for</u> loop, it will then create a subplot for every row in the matrix, and will plot the numbers from each row element in the Figure Window.

```
row1 = [4 9 22];
row2 = [30 18 4];
mat = [row1;row2];
% Save the matrix as an ASCII file.
save xfile.dat mat -ascii
% load data from a file and plot data
% from each line in a separate plot in a subplot
load xfile.dat
[r, c] = size(xfile);
for i = 1:r
    subplot(1,r,i)
    plot(xfile(i,:),'k*')
end
```



9. Write a script that will print the followingmultiplication table:

1

2 4

```
3 6 9

4 8 12 16

5 10 15 20 25
```

```
% Prints a multiplication table
rows = 5;
for i = 1:rows
%     for j = 1:i
%         fprintf('%d ', i*j)
%     end
%     fprintf('\n')
    linspace(i,i*i,i)
end
```

```
ans = 1
ans = 1×2
     2     4
ans = 1×3
     3     6     9
ans = 1×4
     4     8    12    16
ans = 1×5
     5    10    15    20    25
```

10. A machine cuts N pieces of a pipe. After each cut, each piece of pipe is weighed and its length is measured; these 2 values are then stored in a file called *pipe.dat* (first the weight and then the length on each line of the file). Ignoring units, the weight is supposed to be between 2.1 and 2.3, inclusive, and the length is supposedto be between 10.3 and 10.4, inclusive. The following is just the beginningof what will be a long script to work with these data. For now, thescript will just count how many rejects there are. A reject is any piece of pipe that has an invalid weight and/or length. For a simple example, if N is 3 (meaningthree lines in the file) and the file stores:

2.14	**10.30**
2.32	**10.36**
2.20	**10.35**

there is only one reject, the second one, as it weighs too much. The script would print: There were 1 rejects.

```
% Counts pipe rejects. Ignoring units, each pipe should be
% between 2.1 and 2.3 in weight and between 10.3 and 10.4
% in length
row1 = [2.44 10.40];
row2 = [2.23 10.36];
```

```
row3 = [2.20 12.35];
mat = [row1;row2;row3];
% Save the matrix as an ASCII file.
save pipe.dat mat -ascii
% read the pipe data and separate into vectors
load pipe.dat
weights = pipe(:,1);
lengths = pipe(:,2);
N = length(weights);
% the programming method of counting
count = 0;
for i=1:N
    if weights(i) < 2.1 || weights(i) > 2.3 || lengths(i) < 10.3 || lengths(i) > 10.4
        count = count + 1;
    end
end
fprintf('There were %d rejects.\n', count)
```

```
There were 2 rejects.
```