ASSIGNMENT 2 - CH12B083, CH12B084

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Problem 1

Program to estimate A and phi in pendulum equation

Defining variables

```
clc
clear all
close all

t = [0;0.2;0.4;0.6;0.8;1]  % time t
x = [ 1.7651;1.5034;-0.799;-1.972;-0.3891;1.7684] % position of pendulum x

S = sin(2*pi*t); % Sine of 2*pi*t
C = cos(2*pi*t); % Cos of 2*pi*t
```

```
t =

         0
    0.2000
    0.4000
    0.6000
    0.8000
    1.0000


x =

    1.7651
```

```
    1.5034
   -0.7990
   -1.9720
   -0.3891
    1.7684
```

M*res =x

```
M(:,1)=S;        % Matrix M has 1st column Sine 2*pi*t
M(:,2)=C        % Matrix M has 2nd column Cos 2*pi*t
res = M\x       % Solving the equation : M*res=x where res =[Acos(phi);Asin(phi)]

phi = atan(res(2)/res(1)); % tan(phi)=Asin(phi)/Acos(phi)
phid = atand(res(2)/res(1)) % phi in degrees
A = res(1)/cos(phi)        % Using phi value in res(1)=Acos(phi)to get A
```

```
M =

         0    1.0000
    0.9511    0.3090
    0.5878   -0.8090
   -0.5878   -0.8090
   -0.9511    0.3090
   -0.0000    1.0000


res =

    0.9957
    1.7485


phid =

   60.3388


A =

    2.0121
```

Problem 2

```
%%Program to explain the yield z as a function of the reactant concentrations x; y

clear all;
close all;
I = [1;1;1;1;1;1;1;1;1;1];
X = [20;20;30;40;40;50;50;50;60;70];  %reactant x concentration
Y = [10;10;15;22;22;27;27;27;32;40];  %reactant y concentration
```

```
Z = [73;78;85;90;91;87;86;91;75;65];  %compound yield z
x2 = X.*X ;                           %defining square of reactant x concentration
y2 = Y.*Y ;                           %defining square of reactant y concentration
A(:,1)=I;
A(:,2)=X;                             %defining matrix A
A(:,3)=x2;                            %A=[1,X,x2,Y,y2]
A(:,4)=Y;                            % A*Ans=Z
A(:,5)=y2;                           %Ans=[a0;a1;a2;b1;b2]
A
Z
Ans = A\Z
```

```
A =

     1    20   400    10   100
     1    20   400    10   100
     1    30   900    15   225
     1    40  1600    22   484
     1    40  1600    22   484
     1    50  2500    27   729
     1    50  2500    27   729
     1    50  2500    27   729
     1    60  3600    32  1024
     1    70  4900    40  1600
```

```
Z =

    73
    78
    85
    90
    91
    87
    86
    91
    75
    65
```

```
Ans =

   31.3806
    3.2338
   -0.0490
   -0.5609
    0.0438
```

Problem 3

```
%program to obtain lengths of the opposite and the adjacent sides
```

```
%%consider the following information about given triangle
%In triangle 'c' is the hypotenuse
%'A' is the angle(in degree) opposite to the side 'a'
%'b' is the side adjacent(other than hypotenuse) to the angle 'A'


c=10
A=60
a=c*sin(A*pi/180)                          %sin(A*pi/180)=a/c
b=c*cos(A*pi/180)                          %cos(A*pi/180)=b/c
```

```
c =

    10


A =

    60


a =

    8.6603


b =

    5.0000
```

Problem 4

Program to create the given matrix of n+1*n +1 dimensions and to calculate number of elements greater than an input number in the matrix.

```
clear all
close all
```

Creating the given matrix M with parameter n, say 5

```
n=5
for j=1:n+1
```

```
    for i=1:n+1
    M(j,i)=n+j-i; % An element in this matrix is given by n+j-i, where i j is row
    end

end

M
```

```
n =

     5


M =

     5     4     3     2     1     0
     6     5     4     3     2     1
     7     6     5     4     3     2
     8     7     6     5     4     3
     9     8     7     6     5     4
    10     9     8     7     6     5
```

Finding number of elements greater than an input number x say 4

```
x=4

count=0;                        % Counting variable is initially set to 0
for j=1:n+1
    for i=1:n+1
      if(M(i,j)>x)
       count=count+1;              % If the given number is greater than the elemen
                                   % Loop checks for all elements
      end
    end
end


    count
```

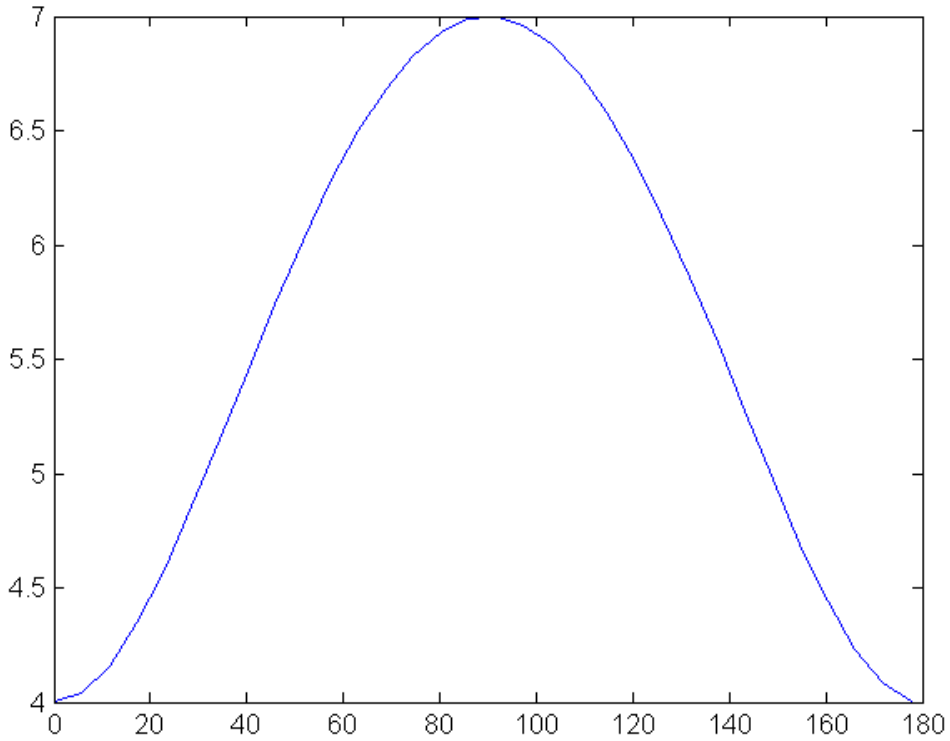
```
x =

     4


count =

    21
```

Problem 5

```
%%file to plot r (radius) of a ellipse
%for given ellipse, semi-major axis 'b'=7
%semi-minor axis 'a'=4
%'theta' is the angle between radius and positive x-axis

clear all;
close all;
a = 4;
b = 7;
i=1;
for theta= 0:0.1:pi             %theta goes from 0 to ?
    x = a*cos(theta);           %x,y are points on the ellipse at given theta
    y = b*sin(theta);
    r(i) = sqrt((x*x)+(y*y));   %r^2=x^2+y^2
    i=i+1;
end

theta= 0:0.1:pi
r

plot(theta*(180/pi),r)          %plotting radius vs theta
```

```
theta =

  Columns 1 through 7

         0    0.1000    0.2000    0.3000    0.4000    0.5000    0.6000

  Columns 8 through 14

    0.7000    0.8000    0.9000    1.0000    1.1000    1.2000    1.3000

  Columns 15 through 21

    1.4000    1.5000    1.6000    1.7000    1.8000    1.9000    2.0000

  Columns 22 through 28

    2.1000    2.2000    2.3000    2.4000    2.5000    2.6000    2.7000

  Columns 29 through 32

    2.8000    2.9000    3.0000    3.1000


r =

  Columns 1 through 7

    4.0000    4.0409    4.1596    4.3453    4.5830    4.8564    5.1499
```

```
Columns 8 through 14

   5.4494    5.7430    6.0207    6.2743    6.4969    6.6833    6.8293

Columns 15 through 21

   6.9316    6.9882    6.9980    6.9608    6.8772    6.7491    6.5791

Columns 22 through 28

   6.3710    6.1295    5.8609    5.5728    5.2744    4.9769    4.6934

Columns 29 through 32

   4.4388    4.2295    4.0813    4.0071
```



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