HOMEWORK-4

SOLUTIONS

3. It is desired to compute the sum of the rst 10 terms of the series $14k^3 - 20k^2 + 5k, k = 1, 2, 3, \ldots$

a. Develop a pseudocode description of the required program.

b. Write and run the program described in part *a*.

Solution:

3a. Pseudocode:

Step 1: Initialize total to zero.

Step 2: Increment ‘k’ value from 1 to 10.

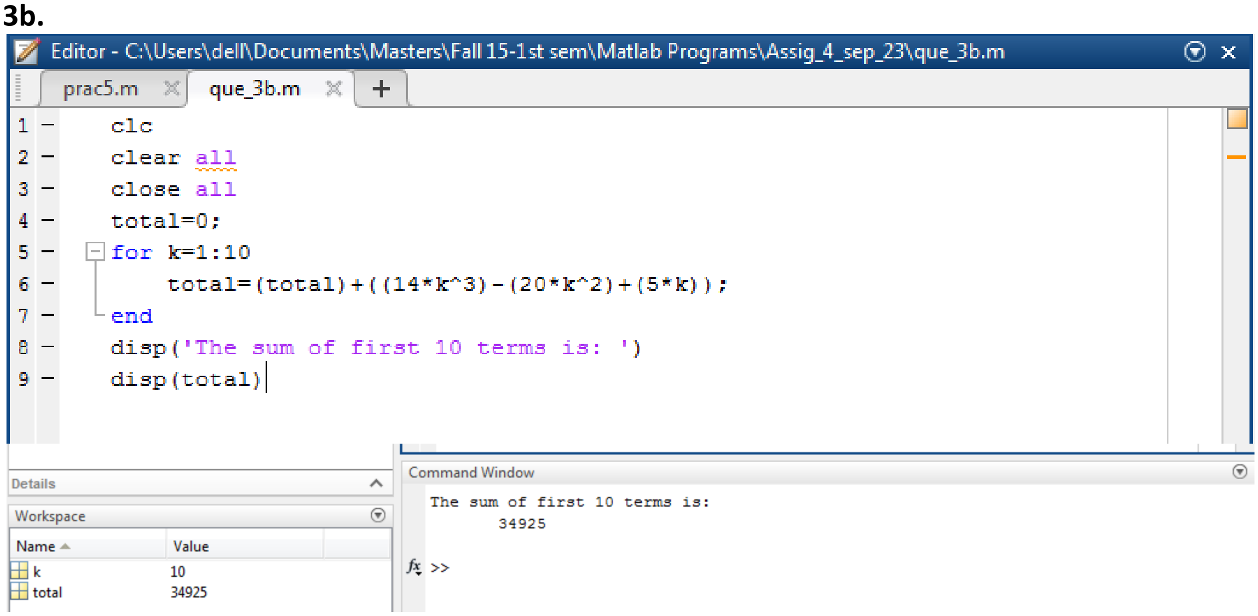
Step 3: For each ‘k’ value, compute the value for ‘total’ and update ‘total’(by summing with previous value)

total=(total)+((14*k^3)-(20*k^2)+(5*k));

Step 4: Display the value for total (sum of first 10 terms)

Step 5: Stop.

3b.



6.* Suppose that `x = [10, -2, 6, 5, -3]` and `y = [9, -3, 2, 5, -1]`. Find the results of the following operations by hand and use MATLAB to check your results.

a. `z = (x < 6)`
b. `z = (x <= y)`
c. `z = (x == y)`
d. `z = (x ~= y)`

Solution:

Editor - C:\Users\dell\Documents\Masters\Fall 15-1st sem\Matlab Programs\Assig_4_sep_23\que_6.m

prac5.m | que_3b.m | que_6.m

```
clc
clear all
close all
x=[10,-2,6,5,-3];
y=[9,-3,2,5,-1];
z1=(x<6)
z2=(x<=y)
z3=(x==y)
z4=(x~=y)
```

Details

Workspace

Name	Value
x	[10,-2,6,5,-3]
y	[9,-3,2,5,-1]
z1	1x5 logical
z2	1x5 logical
z3	1x5 logical
z4	1x5 logical

Command Window

```
z1 =

     0     1     0     1     1


z2 =

     0     0     0     1     1


z3 =

     0     0     0     1     0


z4 =

     1     1     1     0     1
```

10. The arrays `price_A`, `price_B`, and `price_C` given below contain the price in dollars of three stocks over 10 days.

a. Use MATLAB to determine how many days the price of stock A was above both the price of stock B and the price of stock C.

b. Use MATLAB to determine how many days the price of stock A was above either the price of stock B or the price of stock C.

c. Use MATLAB to determine how many days the price of stock A was above either the price of stock B or the price of stock C, but not both.

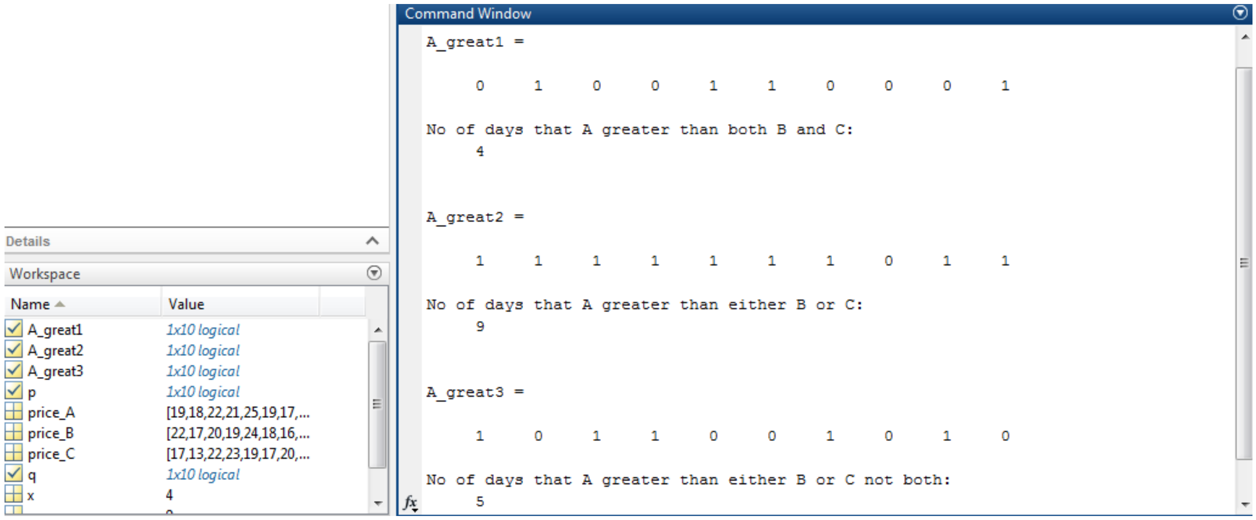
```
price_A = [19, 18, 22, 21, 25, 19, 17, 21, 27, 29]
price_B = [22, 17, 20, 19, 24, 18, 16, 25, 28, 27]
price_C = [17, 13, 22, 23, 19, 17, 20, 21, 24, 28]
```

Solution:

Editor - C:\Users\dell\Documents\Masters\Fall 15-1st sem\Matlab Programs\Assig_4_sep_23\que_10.m

prac5.m | que_10.m | +

```
clear all
close all
price_A=[19,18,22,21,25,19,17,21,27,29];
price_B=[22,17,20,19,24,18,16,25,28,27];
price_C=[17,13,22,23,19,17,20,21,24,28];
%price of A greater than both B and C
A_great1=(price_A>price_B)&(price_A>price_C)
%no of days that price of A> B and C
x=length(find(A_great1));
disp('No of days that A greater than both B and C: ')
disp(x)
% or x=sum(A_great)
% price of A was either above price of B or price of C
A_great2=(price_A>price_B)|(price_A>price_C)
%no of days that price of A either greater than B or greater than C
y=length(find(A_great2));
disp('No of days that A greater than either B or C: ')
disp(y)
%no of days that A above B or C not both
p=(price_A>price_B);
q=(price_A>price_C);
A_great3=xor(p,q)
z=length(find(A_great3));
disp('No of days that A greater than either B or C not both: ')
disp(z)
```



13.* The price, in dollars, of a certain stock over a 10-day period is given in the following array.

```
price = [19, 18, 22, 21, 25, 19, 17, 21, 27, 29]
```

Suppose you owned 1000 shares at the start of the 10-day period, and you bought 100 shares every day the price was below \$20 and sold 100 shares every day the price was above \$25. Use MATLAB to compute (*a*) the amount you spent in buying shares, (*b*) the amount you received from the sale of shares, (*c*) the total number of shares you own after the 10th day, and (*d*) the net increase in the worth of your portfolio.

Solution:

Editor - C:\Users\dell\Documents\Masters\Fall 15-1st sem\Matlab Programs\Assig_4_sep_23\que_13.m

+13 | prac5.m | que_10.m | que_13.m | test_if_else.m | Prac_Chap4_test_different_ways_b.m

```
close all
initial=1000;totamt=0;totamt2=0;
price=[19,18,22,21,25,19,17,21,27,29];
sharebuy=100*(length(find(price<20)))
sharesell=100*(length(find(price>25)))
for k=1:10
    %buying share
    if price(k)<20
        totamt=totamt+(100*price(k));
    elseif price(k)>25
        %selling share
        totamt2=totamt2+(100*price(k));
    end
end
disp('a.Amount spent in buying share: ')
disp(totamt)
disp('b.Amount Received from selling shares:  ')
disp(totamt2)
%c.Total number of shares you own after 10th day
%totbuyshare=100*
Remshare=abs(initial+sharebuy-sharesell);
disp('c.Remaining share that you own: ')
disp(Remshare)
initamt=(price(1).*1000)
finamt=(price(10).*1200)
net=finamt-initamt
```

Command Window

```
sharebuy =

   400


sharesell =

   200

a.Amount spent in buying share:
        7300

b.Amount Received from selling shares:
        5600

c.Remaining share that you own:
        1200


initamt =

       19000
```

```
finamt =

       34800


net =

       15800
```

16. Write a script le using conditional statements to evaluate the following function, assuming that the scalar variable x has a value. The function is $y = e^{x+1}$ for $x < -1$, $y = 2 + \cos(\pi x)$ for $-1 \le x < 5$, and $y = 10(x - 5) + 1$ for $x \ge 5$. Use your le to evaluate y for $x = -5$, $x = 3$, and $x = 15$, and check the results by hand.

Solution:

Editor - C:\Users\dell\Documents\Masters\Fall 15-1st sem\Matlab Programs\Assig_4_sep_23\que_16.m

+7 | Prac_Chap4_test_understanding (1).m | Prac_for_loop.m | test_name_entering.m | que_16.m

```
clc
clear all
close all
xmax=20; xmin=-10;
diff=(xmax-xmin)/200;
x=xmin:diff:xmax;
for k=1:length(x)
    if x(k)>=5
        y(k)=(10*(x(k)-5))+1;
    elseif -1<=x(k)<5
        y(k)=2+(cos(pi*x(k)));
    else
        y(k)=exp(x(k)+1);
    end
end
plot(x,y),title('conditional statement')
% kk1=round((-5-xmin)/diff); kk2=round((3-xmin)/diff); kk3=round((15-xmin)/d
% disp(x(kk1)), (x(kk2)), (x(kk3))
% disp(y(kk1)), (y(kk2)), (y(kk3))
%x=-5
y1=ginput(1)
%x=3
y2=ginput(2)
%x=15
y3=ginput(3)
```

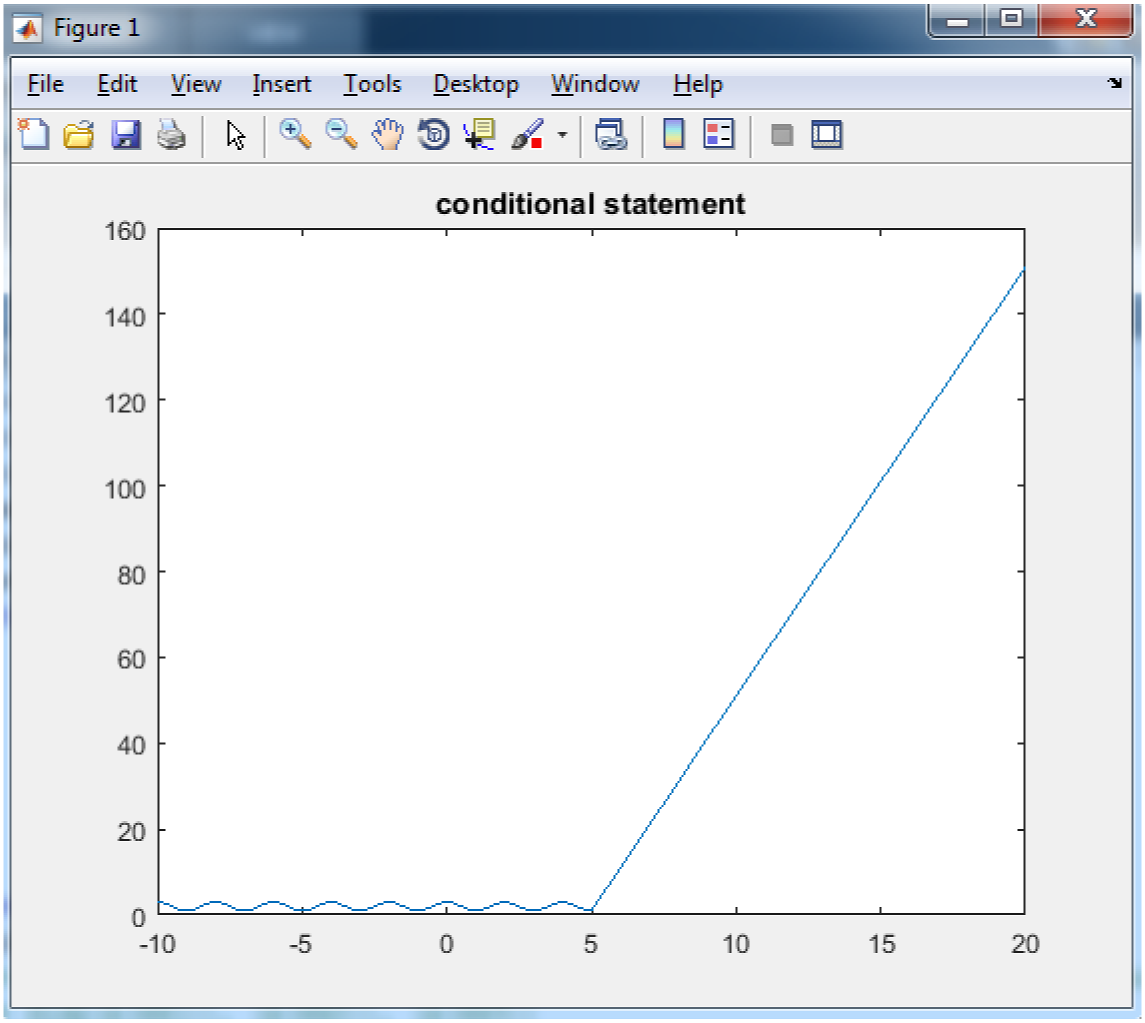
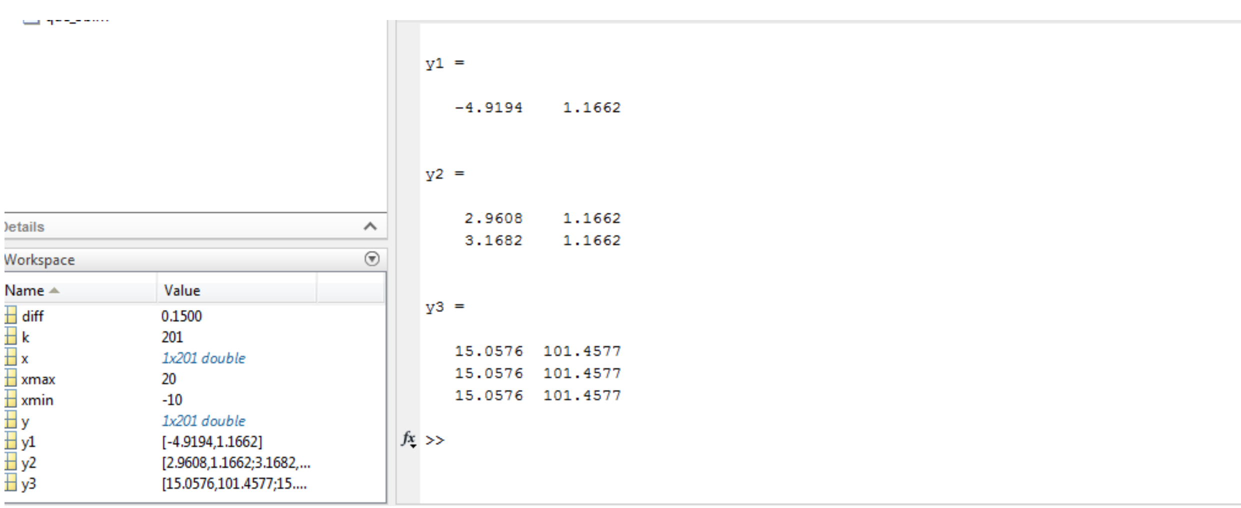


Figure 1
File Edit View Insert Tools Desktop Window Help
conditional statement
160
140
120
100
80
60
40
20
0
-10
-5
0
5
10
15
20


Details
Workspace
Name
Value
diff 0.1500
k 201
x 1x201 double
xmax 20
xmin -10
y 1x201 double
y1 [-4.9194,1.1662]
y2 [2.9608,1.1662;3.1682,...
y3 [15.0576,101.4577;15....
y1 =
-4.9194 1.1662
y2 =
2.9608 1.1662
3.1682 1.1662
y3 =
15.0576 101.4577
15.0576 101.4577
15.0576 101.4577
fx >>

18. Write a program that accepts a numerical value x from 0 to 100 as input and computes and displays the corresponding letter grade given by the following table.

A $x \geq 90$

B $80 \leq x \leq 89$

C $70 \leq x \leq 79$

D $60 \leq x \leq 69$

F $x < 60$

a. Use nested `if` statements in your program (do not use `elseif`).

b. Use only `elseif` clauses in your program.

Solution:

Editor - C:\Users\dell\Documents\Masters\Fall 15-1st sem\Matlab Programs\Assig_4_sep_23\que_18b.m

Prac_for_loop.m | test_name_entering.m | que_16.m | test4.m | que_18b.m

```
clc
clear all
close all
x=input('Enter your mark: ');
if x>=90
    disp('A Grade')
elseif (80<=x)&&(x<=89)
    disp('B Grade')
elseif (70<=x)&&(x<=79)
    disp('C Grade')
elseif (60<=x)&&(x<=69)
    disp('D Grade')
else
    disp('E Grade')
end
```

Command Window

```
Enter your mark: 72
C Grade
>>
```

Without using else

Editor - C:\Users\dell\Documents\Masters\Fall 15-1st sem\Matlab Programs\Assig_4_sep_23\que_18a.m

+8 | test_name_entering.m | que_16.m | test4.m | que_18b.m | que_18a.m

```
clc
clear all
close all
x=input('Enter your mark: ');
if x>=90
    disp('A Grade')
end
if (80<=x)&&(x<=89)
    disp('B Grade')
end
if (70<=x)&&(x<=79)
    disp('C Grade')
end
if (60<=x)&&(x<=69)
    disp('D Grade')
end
if x<60
    disp('E Grade')
end
```

Command Window

```
Enter your mark: 62
D Grade
>>
```

20. Figure P20 shows a mass-spring model of the type used to design packaging systems and vehicle suspensions, for example. The springs exert a force that is proportional to their compression, and the proportionality constant is the spring constant k. The two side springs provide additional resistance if the weight W is too heavy for the center spring. When the weight W is gently placed, it moves through a distance x before coming to rest. From statics, the weight force must balance the spring forces at this new position. Thus

$$W = k_1 x \qquad \text{if } x < d$$
$$W = k_1 x + 2k_2(x - d) \qquad \text{if } x \geq d$$

These relations can be used to generate the plot of x versus W.

a. Create a function le that computes the distance x, using the input parameters W, k_1, k_2, and d. Test your function for the following two cases, using the values $k_1 = 10^4$ N/m; $k_2 = 1.5 \times 10^4$ N/m; $d = 0.1$ m.

$$W = 500 \text{ N}$$
$$W = 2000 \text{ N}$$

b. Use your function to plot x versus W for $0 \leq W \leq 3000$ N for the values of k_1, k_2, and d given in part a.

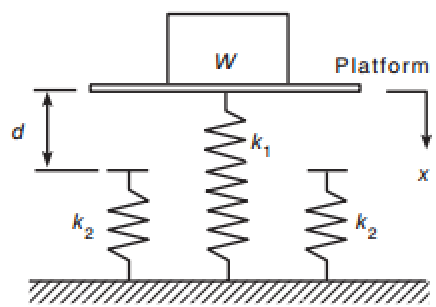


Figure P20

Solution:

Editor - C:\Users\dell\Documents\Masters\Fall 15-1st sem\Matlab Programs\Assig_4_sep_23\que_20a.m

que_16.m | que_18b.m | que_18a.m | springdist.m | que_20a.m

```
clc
clear all
close all
d=0.1;  k1=10^4;k2=1.5*10^4;
W=[500,2000];
% to find value for x
for i=1:length(W)
    x=springdist(W(i),k1,k2,d)
end
W1=0:1:3000;
plot(springdist(W1,k1,k2,d),W1)
```

Editor - C:\Users\dell\Documents\Masters\Fall 15-1st sem\Matlab Programs\Assig_4_sep_23\springdist.m

+14 | que_16.m | que_18b.m | que_18a.m | springdist.m | que_20a.m | +

```
function x=springdist(W,k1,k2,d)
x=W/k1;
if x>=d
x=(W+(2*k2*d))/(k1+2*k2);
end
```

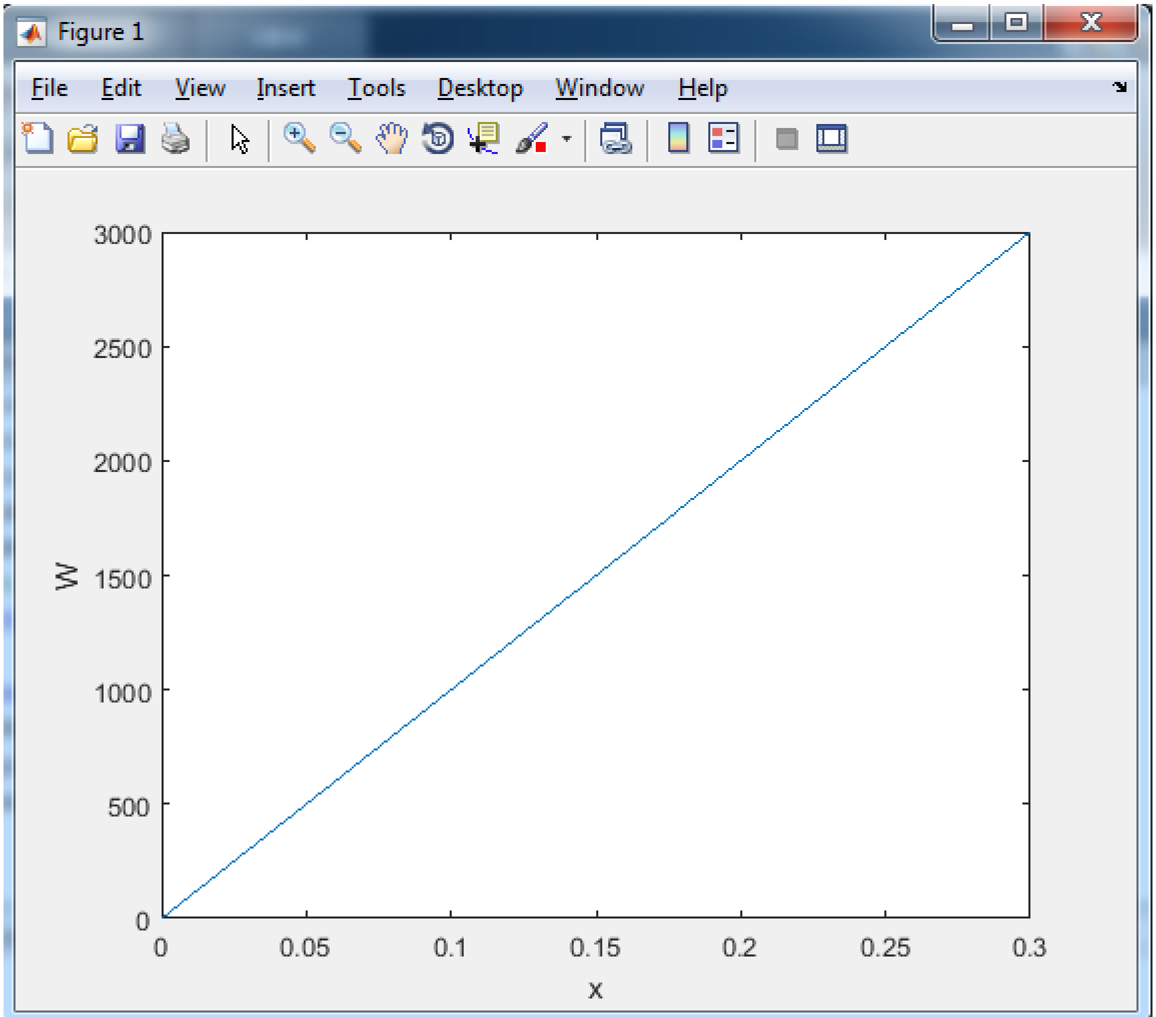
Command Window

```
x =

    0.0500


x =

    0.1250
```



23. The (x, y) coordinates of a certain object as a function of time t are given by

$$x(t) = 5t - 10 \qquad y(t) = 25t^2 - 120t + 144$$

for $0 \le t \le 4$. Write a program to determine the time at which the object is the closest to the origin at (0, 0). Determine also the minimum distance. Do this in two ways:

a. By using a `for` loop.

b. By not using a `for` loop.

Solution:

Editor - C:\Users\dell\Documents\Masters\Fall 15-1st sem\Matlab Programs\Assig_4_sep_23\que_23.m

```matlab
clc
clear all
close all
t=0:0.01:4;
x=((5*t)-10);
y=((25*t.^2)-(120.*t)+144);
d=sqrt(x.^2+y.^2);
mini=10
% r=min(d)
for k=1:length(t)
    if d(k)<mini
        mini=d(k);
        tmin=t(k);
    end
end
disp('Min distance is: ')
disp(mini)
disp('time: ')
disp(tmin)
```

Editor - C:\Users\dell\Documents\Masters\Fall 15-1st sem\Matlab Programs\Assig_4_sep_23\que_23b.m

```matlab
clc
clear all
close all
t=0:0.01:4;
x=((5*t)-10);
y=((25*t.^2)-(120.*t)+144);
d=sqrt(x.^2+y.^2);
[dist,k]=min(d)
tmin=t(k)
disp('min distance: ')
disp(dist)
disp('time: ')
disp(tmin)
```

```
Command Window
k =

   224


tmin =

    2.2300

min distance:
    1.3581

time:
    2.2300
```

26. Electrical resistors are said to be connected "in series" if the same current passes through each and "in parallel" if the same voltage is applied across each. If in series, they are equivalent to a single resistor whose resistance is given by

$$R = R_1 + R_2 + R_3 + \cdots + R_n$$

If in parallel, their equivalent resistance is given by

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \cdots + \frac{1}{R_n}$$

Write an M- le that prompts the user for the type of connection (series or parallel) and the number of resistors n and then computes the equivalent resistance.

Solution:

Editor - C:\Users\dell\Documents\Masters\Fall 15-1st sem\Matlab Programs\Assig_4_sep_23\que_26.m

+10 | que_18a.m | springdist.m | que_20a.m | que_23.m | test1_28_09.m | que_26.m

```
clc
clear all
close all
R=1:1:20;
x=input('Enter the connection type: ','s')
if x=='S'
    EqRes=sum(R);
elseif x=='P'
    EqRes=1./(sum(R));
else
    disp('Please Enter correct connection type')
end
disp(EqRes)
```

```
Command Window
Enter the connection type: S

x =

S

   210
```

36.* In the structure in Figure P36a, six wires support three beams. Wires 1 and 2 can support no more than 1200 N each, wires 3 and 4 can support no more than 400 N each, and wires 5 and 6 can support no more than 200 N each. Three equal weights *W* are attached at the points shown. Assuming that the structure is stationary and that the weights of the wires and the beams are very small compared to *W*, the principles of statics applied to a particular beam state that the sum of vertical forces is zero and

Solution:

```
+11 | springdist.m | que_20a.m | que_23.m | test1_28_09.m | que_26.m | que_36.m | +
```

```matlab
clc
clear all
close all
X=[1,1,-1,-1,0,-1;1.4,-1,-0.8,0,-1,2;0,0,1,1,-1,0;
    0,0,0,3,-2,0;0,0,0,0,1,1;0,0,0,0,0,3];
for w=1:1200
W=[w;w;w;w;w;w];
T=X\W;
if T<=[1200;1200;400;400;200;200]
    optimalwt= w;
end
end
% disp(optimalwt)
w2=max(optimalwt)
W=[w2;w2;w2;w2;w2;w2];
T=X\W
```

Command Window

```
    300


w2 =

    300


T =

  588.8889
  311.1111
  266.6667
  233.3333
  200.0000
  100.0000

>>
```