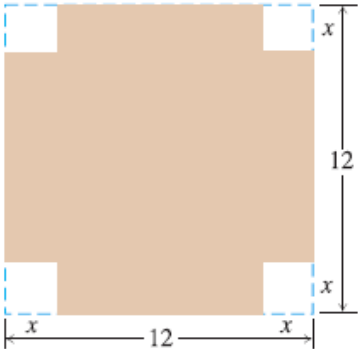
MATLAB EXPERIMENT-2

20BCE1209

Q1 An open-top box is to be made by cutting small congruent squares from the corners of a 12-in.-by-12-in. sheet of tin and bending up the sides. How large should the squares cut from the corners be to make the box hold as much as possible?



CODE:-

```
clear
clc
syms x
s=12;                          %given side of sheet(in inchs)
f=x*(s-2*x)^2;                 % volume of box formed
fx=diff(f,x);                  %finding single derivative
ax=solve(fx,x);                %finding critical points
ax=double(ax);
fxx=diff(fx,x);                %double derivative
for y=1:length(ax)
   k=subs(fxx,x,ax(y));
    if k<0
        sprintf("max volume is achieved when cut are of %d
inch",ax(y))
        sprintf('max volume %d inch^3',subs(f,x,ax(y)))
    end
end
```

OUTPUT:-

COMMAND WINDOW

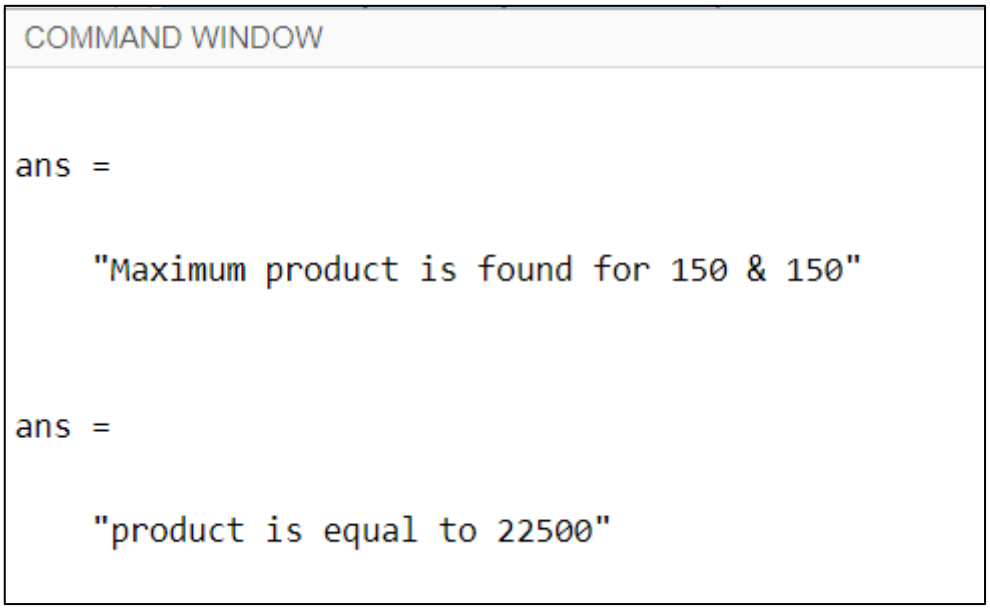
```
ans =

    "max volume is achieved when cut are of 2 inch"


ans =

    'max volume 128 inch^3'

>>
```

Q2 Find two positive numbers whose sum is 300 and whose product is a maximum.

CODE:-

```
clear
clc
syms x
f=x*(300-x);    %sum of numbers is 300
                %product of two given numbers
fx=diff(f,x);
ax=solve(fx,x);
ax=double(ax);
fxx=diff(fx,x);
for i=1:length(ax)
    z=subs(fxx,x,ax(i));
    if z<0
        sprintf("Maximum product is found for %d & %d",ax(i),300-
ax(i))
        sprintf("product is equal to %d",subs(f,x,ax(i)))
    end
end
```

OUTPUT:-



Q3 Find the area of the regions enclosed by the curves $y = x^2 - 2x, y = x.$

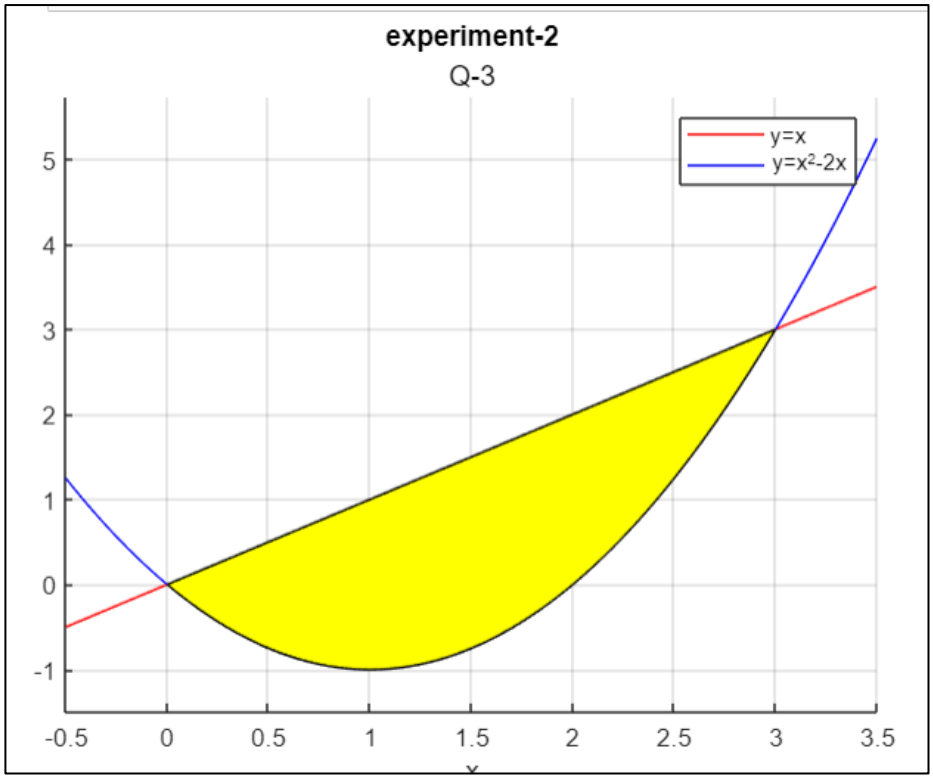
CODE:-

```
clear
clc
syms x
y1=x^2-2*x;
y2=x;
ax=solve(y2-y1,x);
ax=double(ax);
D=[ax(1)-0.5 ax(2)+0.5];
Area=int(y2-y1,ax(1),ax(2));
sprintf("Area between curves is %f",Area)
hold on
z1=ezplot(y2,D);grid on;
set(z1,"color","r");
z2=ezplot(y1,D);
set(z2,"color","b");
xv=linspace(ax(1),ax(2));
y1v=subs(y1,x,xv);
y2v=subs(y2,x,xv);
X=[xv,xv];
Y=[y1v,y2v];
fill(X,Y,'y'),title experiment-2 Q-3;
legend("y=x","y=x^2-2x");
```

OUTPUT:-

COMMAND WINDOW

```
ans =

    "Area between curves is 4.500000"
```


experiment-2
Q-3
y=x
y=x²-2x
5
4
3
2
1
0
-1
-0.5
0
0.5
1
1.5
2
2.5
3
3.5
x

Q4 Find Laplace Transform of $f(t)=\begin{cases} t^2, t<2 \\ t-1, 2<t<3. \\ 7, t>3 \end{cases}$

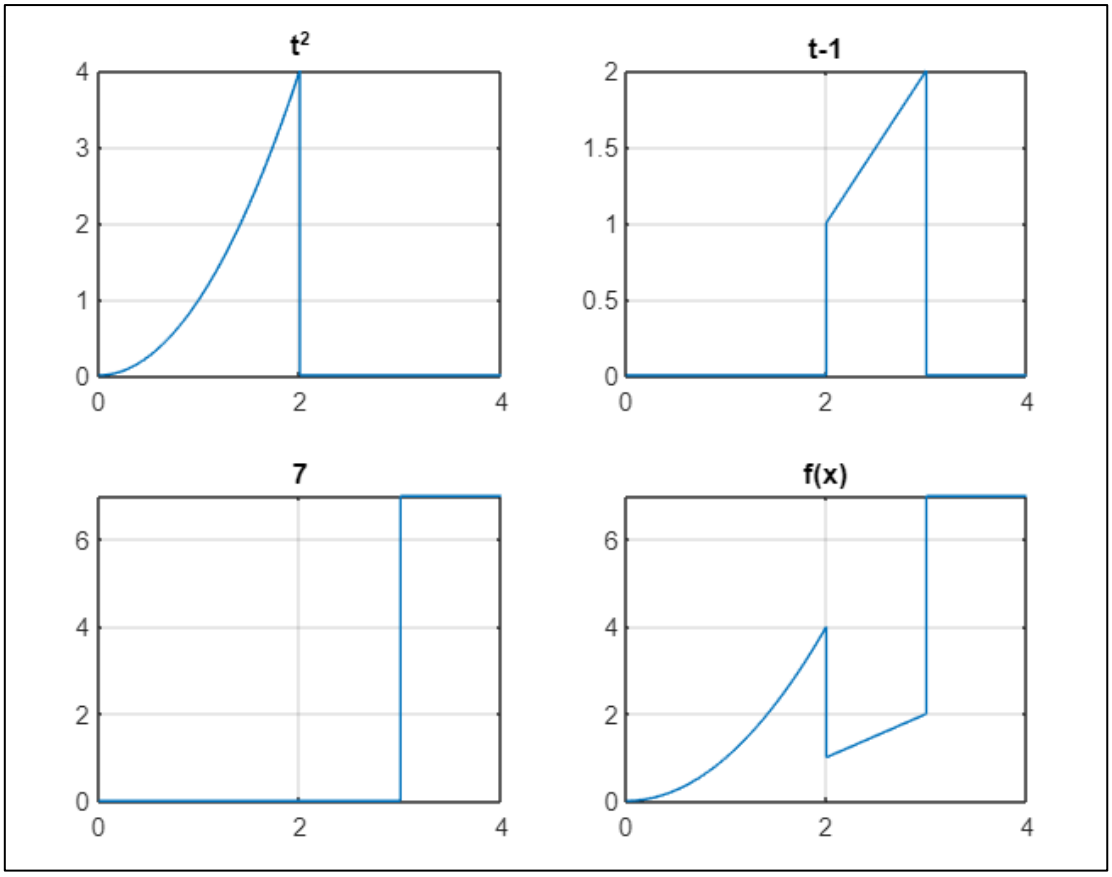
CODE

```
clear
clc
syms x
f1=x^2*(heaviside(x)-heaviside(x-2));
f2=(x-1)*(heaviside(x-2)-heaviside(x-3));
f3=7*heaviside(x-3);
f=f1+f2+f3;
F=laplace(f);
F=simplify(F);
disp("Laplace transform is:-")
disp(F);
D=[0 4];
subplot(2,2,1)
fplot(f1,D),grid on,title t^2;
subplot(2,2,2)
fplot(f2,D),grid on,title t-1;
subplot(2,2,3)
fplot(f3,D),grid on,title 7;
subplot(2,2,4)
fplot(f,D),grid on,title f(x);
```

OUTPUT:-

COMMAND WINDOW

```
Laplace transform is:-
-(exp(-3*s)*(s - 2*exp(3*s) + 2*exp(s) + 3*s^2*exp(s) + 3*s*exp(s) - 5*s^2))/s^3
```


t²
t-1
7
f(x)
0
1
2
3
4
0.5
1.5
6
0
2
4

Q5 Find the Laplace transform of $f(t)=\begin{cases} t, 0<t<1 \\ 2-t, 1<t<2 \end{cases}$; $f(t+2)=f(t)$,

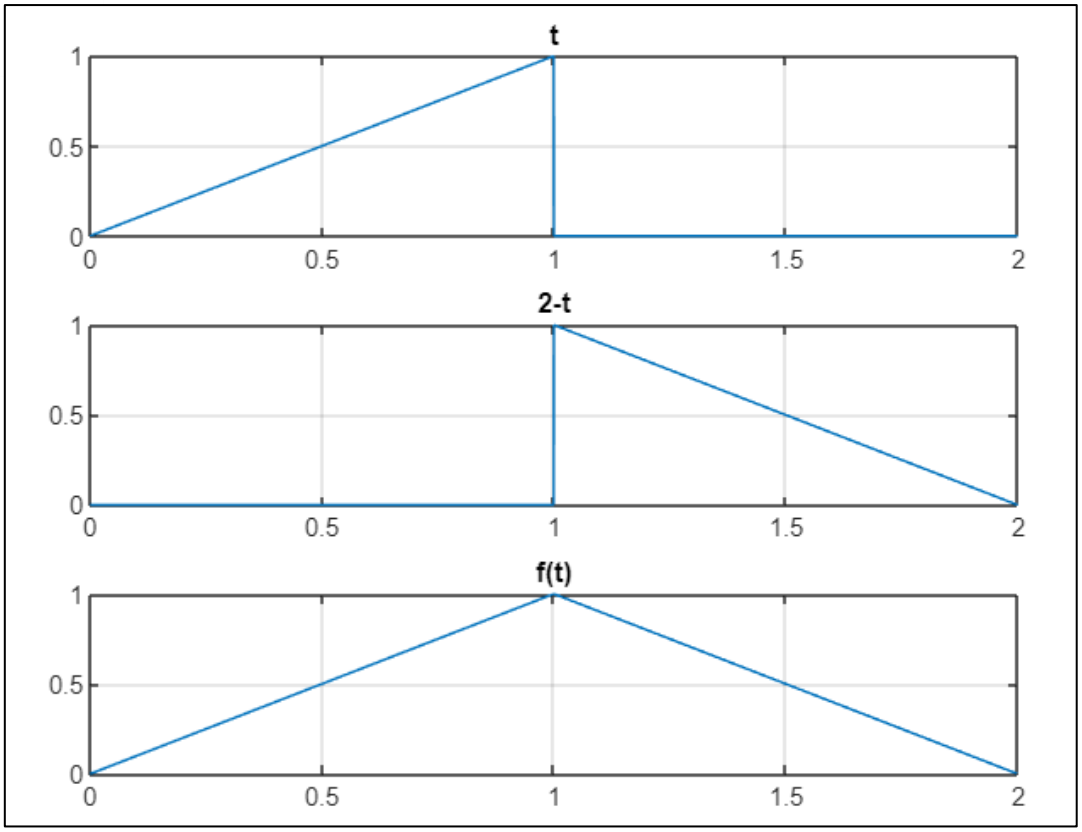
CODE

```
clear
clc
syms t s
f1=t*(heaviside(t)-heaviside(t-1));
f2=(2-t)*(heaviside(t-1)-heaviside(t-2));
f3=7*heaviside(t-3);
f=f1+f2;
F=laplace(f);
F=F/(1-exp(2*s));
F=simplify(F);
disp("Laplace transform is:-");
disp(F);
D=[0 2];
subplot(3,1,1)
fplot(f1,D),grid on ,title t
subplot(3,1,2)
fplot(f2,D),grid on,title 2-t
subplot(3,1,3)
fplot(f,D),grid on,title f(t)
```

OUTPUT:-

COMMAND WINDOW

```
Laplace transform is:-
-(exp(-2*s)*(exp(s) - 1))/(s^2*(exp(s) + 1))
```


t
2-t
f(t)
0
0.5
1
1.5
2