Understanding Calculus using MATLAB

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Contents

Introduction to MATLAB

Aim : MATLAB is used for simulating codes to perform mathematical operations and to find out the output of mathematical problems.

Here we write the matlab code for finding maximum of two numbers and to find the appropriate output using simulation.

```
% Code for finding maximum of two numbers
clc
clear all
x=input("Enter two two numbers")
if x(1)>x(2)
    fprintf("%d is the biggest number",x(1))
else
    fprintf("%d is the biggest number",x(2))
end
```

OUTPUT:

```
Enter the two numbers:
[12 34]
34 is the biggest number
```

```
% Code for finding maximum of three numbers
clc
clear all
x=input('Enter three numbers')
a=x(1);
b=x(2);
c=X(3);
if a>b & a>c
fprintf('%d is the maximum',a)
elseif b>a & b>c
fprintf('%d is the maximum',b)
else
fprintf('%d is the maximum',c)
end
```

OUTPUT:

```
Enter the three numbers:
[123 23 23]
123 is the maximum
```

Graph Plots and MATLAB Onramp Certificat

Aim : Here is the MATLAB Onramp Certificate which is obtained after con
100% beginner training on MATLAB

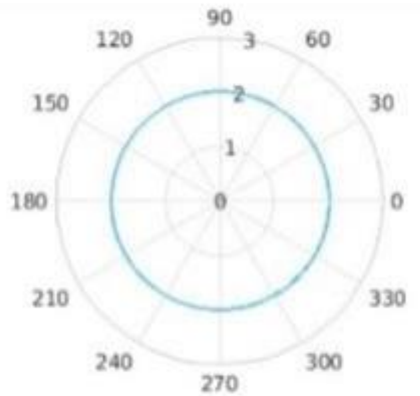
Conclusion : MATLAB Onramp Certificate is obtained after completing training on MathWorks.

Flow Control and Conditional Statements

Aim : Here we write the code for evaluating flow control and conditional statements which is highly useful for applied geometry.

```
% LAB 3 : Flow Control and Conditional Statements
% Plot the circle with radius-2 and center(0,0) using polarplot
clc
clear all
theta=0:0.01:2*pi;
r=2*ones(siza(theta,2));
polarplot(theta,r,'linewidth',2)
```

OUTPUT:



Conclusion : We have written code for plotting a circle with a radius of 2 units and centred at origin.

Applications of Derivatives

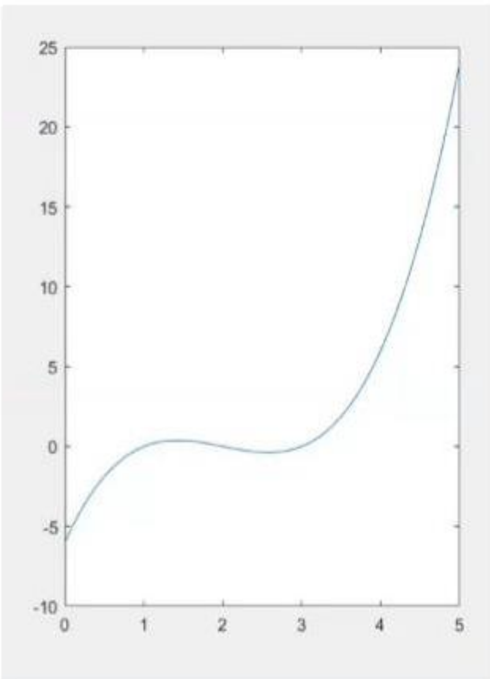
Aim : Here we write the code for evaluating basic applications of derivatives using MATLAB and finding output using simulation

INPUT:

```
%Method of Langrange Multiplier
%Design an square based closed rectangular box with Maximum volume
%52 sq.ft. Area
clc
clear all
syms x y L;
f=x^y*y;
g=x^2+4*x*y-52;
diff_f=gradient(f,[x,y]);
diff_lg=L*gradient(g,[x,y]);
fx=diff_f(1);fy=diff_f(2);
lgx=diff_lg(1);lgy=diff_lg(2);
%eqns=[fx-lgx==0,fy-lgy==0,g==0];
vars=[x y L ];
[sol_x,soly,sol_L]=solve([fx-lgx==0,fy-lgy==0,g==0],vars);
xyL_Values=[sol_x,sol_y,sol_L];
result=subs(f,{x,y,L,},xyL_Values(2,:));

%Display the maximum value and minimum value of the volume
```

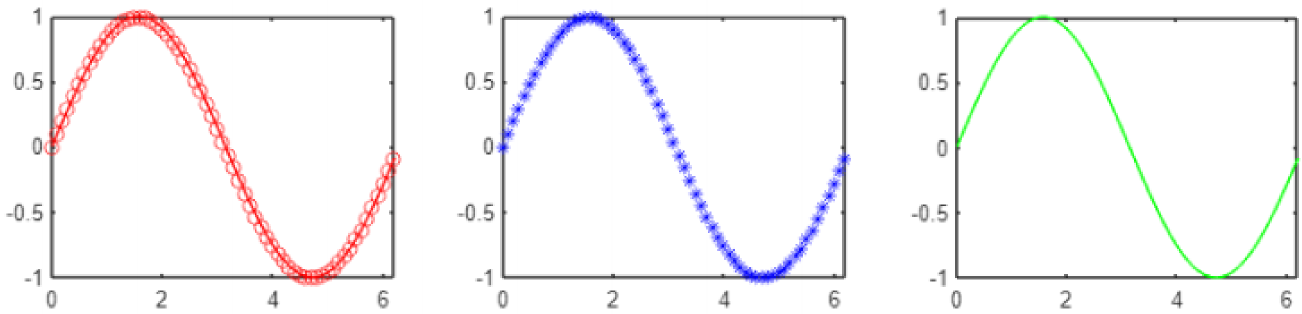
OUTPUT:



INPUT:

```
%Plot sinx function from 0 to pi/2
clc
clear all
x=0:0.1:2*pi;
y=sin(x);
subplot(2,2,4)
plot(x,y,'b*')
subplot(2,2,3)
plot(x,y,'r-o')
subplot(2,2,2)
plot(x,y,'g-')
```

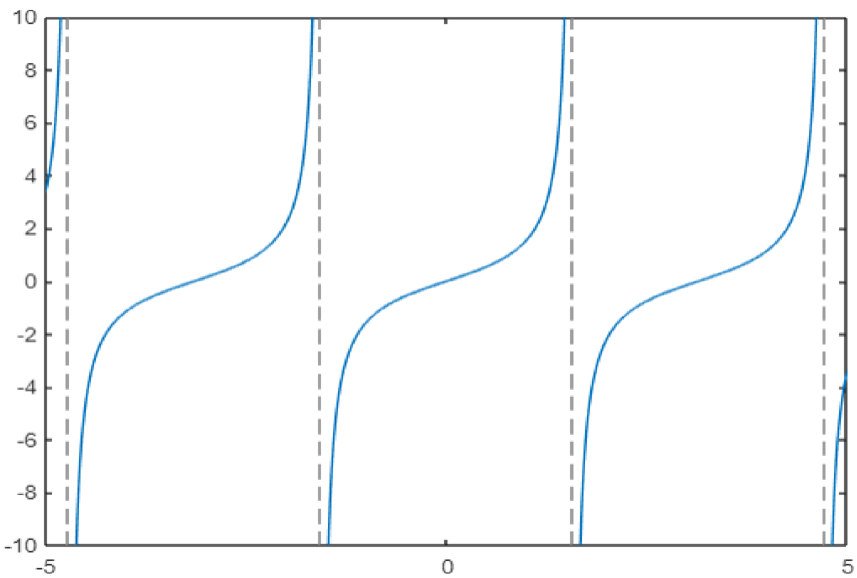
OUTPUT:



INPUT:

```
Plot tan(x) over the default range of [0,T].
syms x
fplot(tan(x))
```

OUTPUT:



Conclusion : We have written and evaluated code for explaining method of Langrange multiplier for designing close rectangular box and to plot sin(x) and tan(x) functions.

Applications of Integrals

Aim : Her we write the code to evaluate the basic applications of integrals and their output using simulation.

INPUT:

```
// Finds volume of a triangular prism
#include<stdio.h>

void main()
{
    float base, height;
    float volume=0;
    printf("\nFinds volume of a triangle prism\n-------------------");
    printf("\nEnter base: ");
    scanf("%f", &base);
    printf("\nEnter height: ");
    scanf("%f", &height);

    volume = ((float)1/(float)2)*base*height*height;

    printf("Volume of a triangle prism is: %.2f", volume);
}
```

OUTPUT:

```
$ cc volume-of-triangle-prism.c
$ ./a.out

Finds volume of a triangle prism
-------------------
Enter base

Enter height
Volume of a triangle prism
```

Conclusion : We have written code to evaluate volume of a triangular prism using concepts and applications of integrals.

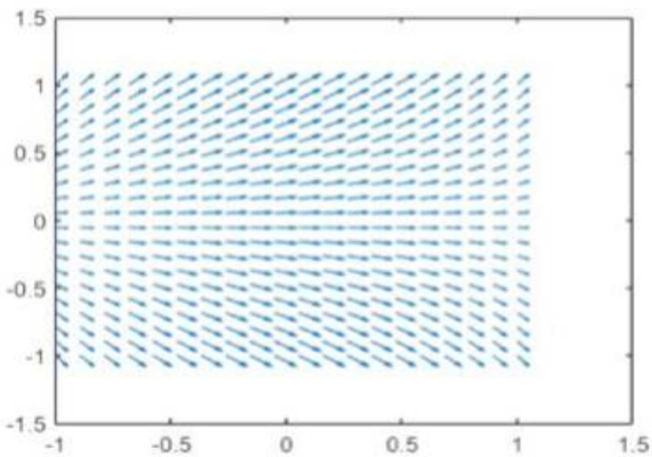
Applications of Vector Integrals

Aim : Here we write the code to evaluate applications of vector integrals.

% Draw the two dimensional vector field for the vector
cos x $\boldsymbol{i}$ + sin y $\boldsymbol{j}$

```
clc
clear all
syms x y;
F=[cos(x) sin(y)];
f1=inline(vectorize(F(1)),'x','y');
f2=inline(vectorize(F(2)),'x','y');
x=linspace(-1,1,20);
y=x;
[X,Y]=meshgrid(x,y);
U=f1(X,Y);
V=f2(X,Y);
quiver(X,Y,U,V)
```

OUTPUT :



```
% Integrate f(x, y, z) = x - 3y^2 +z over the line segment C
joining the origin to the point (1, 1, 1).

clc
clear all
syms x y z;
f=x-(3*(y*y))+z;
df=int(int(int(f,x,0,1),y,0,1),z,0,1)
```

OUTPUT :

```
df =   0
```

```
% Find the work done by the force F = xy i + (y - x) j over
the straight line from (1, 1) to (2, 3).?

clc
clear all
syms x y t;
rbarx=t+1;
rbary=2*t+1;
drx = diff(rbarx,t);
dry = diff(rbary,t);
fi=subs(subs(x*y,rbarx),rbary);
fj=subs(subs(y-x,rbarx),rbary);
WDone= int((fi * drx)+(fj * dry),t,0,1)
```

OUTPUT :

```
WDone = 25/6
```

Solving Ordinary Differential Equations

Aim : Here we write the code to solve ordinary differential equations

```
%Solve the differential equation y' = (2xy − sin x − 3y2exp(x))/(6y exp(x) − x2) with initial
condition  y(0) = 2.
clc
clear all
syms y x y(x)
eqns=diff(y,x)-(2*x*y-sin(x)-3*y^2*exp(x))/(6*y*exp(x)-x^2);
conds=[y(0)==2];
y(x)=dsolve(eqns,conds)
```

OUTPUT

y(x) = (exp(-x)*(x^2 + (132*exp(x) + 12*exp(x)*cos(x) + x^4)^(1/2)))/6

Solve the differential equation $y'' - 2y' - 3y = 0$ with initial conditions $y(0) = 1$, $y'(0) = 2$.

```
clc
clear all
syms x y y(x)
eqn=diff(y,x,2)-2*diff(y,x)-3*y==0;
y1=diff(y,x);
cond=[y(0)==1,y1(0)==2];
y(x)=dsolve(eqn,cond)
```

OUTPUT

y(x) = (exp(-x)*(3*exp(4*x) + 1))/4

%A resistance of 100Ω, an inductance of 0.5 henery are conducted in a series with a battery of 20 volts. Find the current in the circuit at t = 0.5sec, if i = 0 at t = 0.

```
clc
clear all
syms i t i(t)
eqn=diff(i,t)+200*i-40==0;
cond=[i(0)==0];
i(t)=dsolve(eqn,cond);
a=subs(i(t),t,0.5)
```

OUTPUT

```
a = 1/5 - exp(-100)/5
```

Conclusion : In this code we solved two differential equations and their applications in solving electric circuits.

Conclusion

Here we conclude from our lab report that we have learnt useful applications of calculus particularly for the aspect of engineering students irrespective of their branch or specialization since calculus is used in all fields of engineering because of its utmost importance.