Sem II

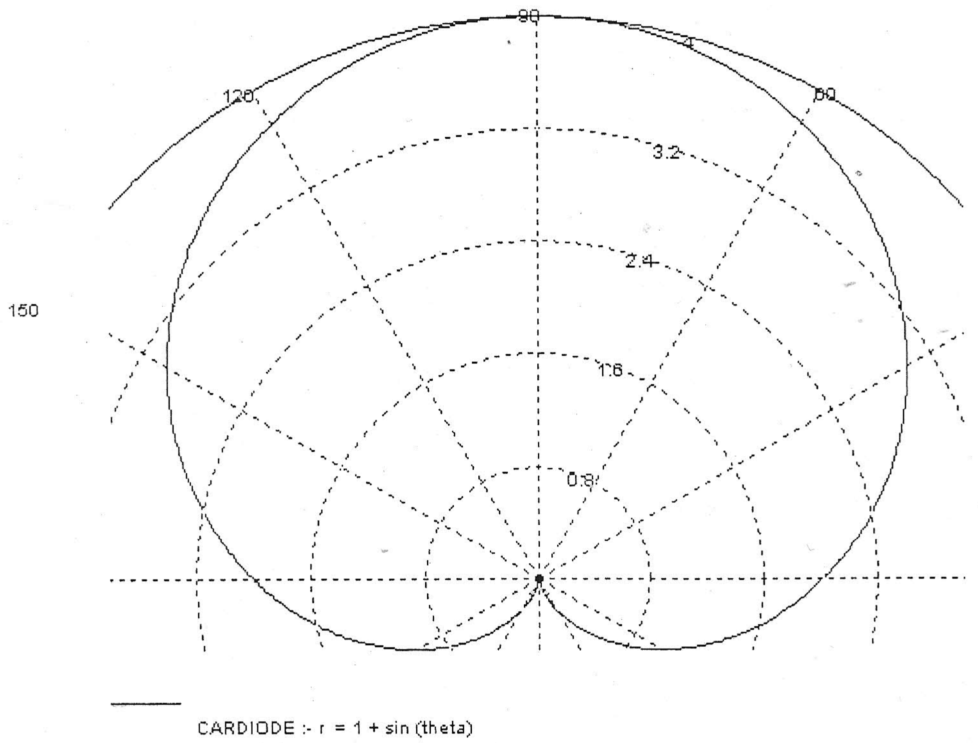
SCILAB Tutorials

Tutorial 1- Curve Tracing

1) Trace the curve given by r=a(1+sinθ).

```
theta=0:.01:2*%pi;  //populate the vector theta with values from 0 to 2π in steps of 0.01.
a=2;                       // 'a' can be given different integer values
r=a*(1+sin(theta));
polarplot(theta,r,leg="CARDIODE :- r  = 1 + sin (theta)") //draw the graph in polar
                                                   //coordinates of the angle theta versus r
```

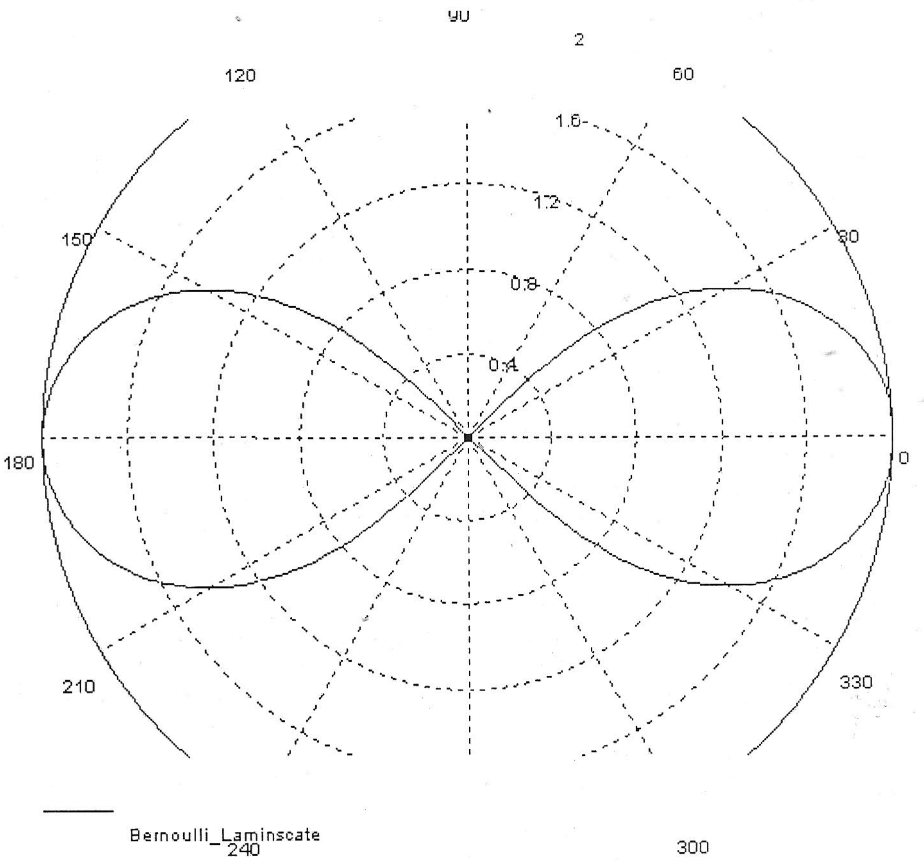
OUTPUT:



2) Trace the curve given by $r^2=a^2\cos 2\theta$.

```
theta=0:.01:2*%pi;  //populate the vector  theta with values from 0 to 2π in steps of 0.01.
a=2;                         // 'a' can be given different integer values
for i=1:629                  //there are 629 values in the vector theta
if (cos(2*theta(i))) <0 then             //comparing whether cos2θ is negative
r(i)=0;                            //make r zero if cos2θ is negative
else
r(i)=a*((sqrt(cos(2*theta(i)))));        //calculate values of r if cos2θ is positive
end                                      //end the if proposition
end                                      //end the for loop
polarplot(theta,r,leg="Bernoulli_Laminscate")        //draw the graph in polar coordinates //of the
                                                     angle theta versus r
```

OUTPUT:



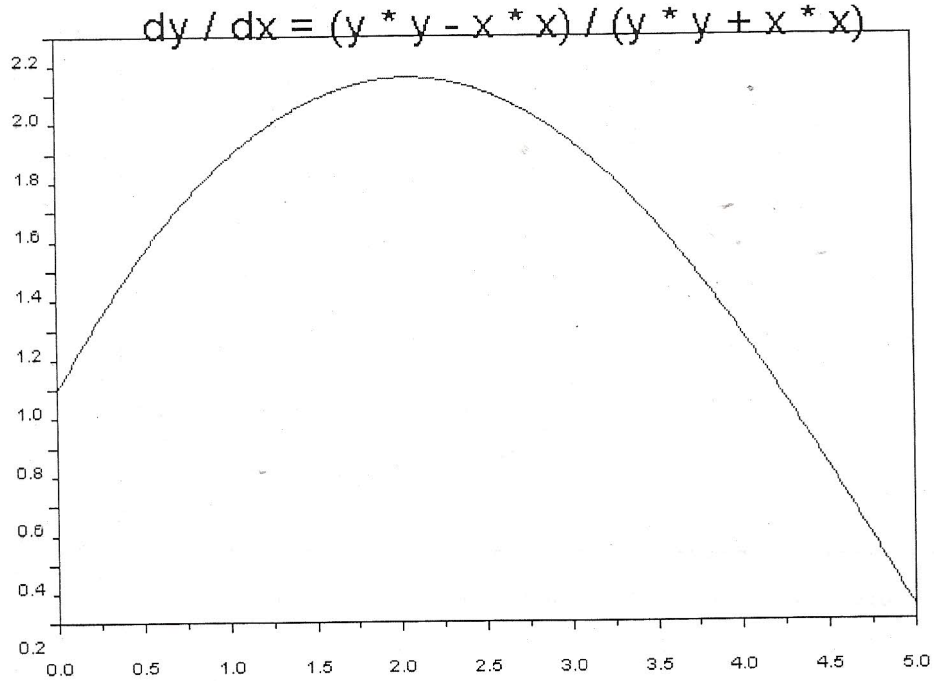
Tutorial 2 - Differential Equations

1) Solve $dy/dx=(y^2-x^2)/(y^2+x^2)$ given $y(0)=1$ and find $y(0.2)$ & $y(0.4)$.

```
function ydot=f(x,y),
ydot=(y^2-x^2)/(y^2+x^2), endfunction       //define the function dy/dx=(y²-x²)/(y²+x²)
y0=1;                                        //specify the initial conditions
x0=0;                                        //specify the initial conditions
x=0:.01:5;        //populate x vector with values from 0 to 0.5 with an interval of 0.01
y=ode(y0,x0,x,f);      //Find y for all x ranging from 0 to 0.5
plot(x,y)              //plot y against x
title('dy/ dx = (y* y- x * x)/(y * y + x * x)','fontsize',5)  //Give the title to the plot with a
                                                              //font size of 5

y1=ode(y0,x0,0.2,f)     //Find y for x =0.2
y2=ode(y0,x0,0.4,f)     //Find y for x =0.4
```

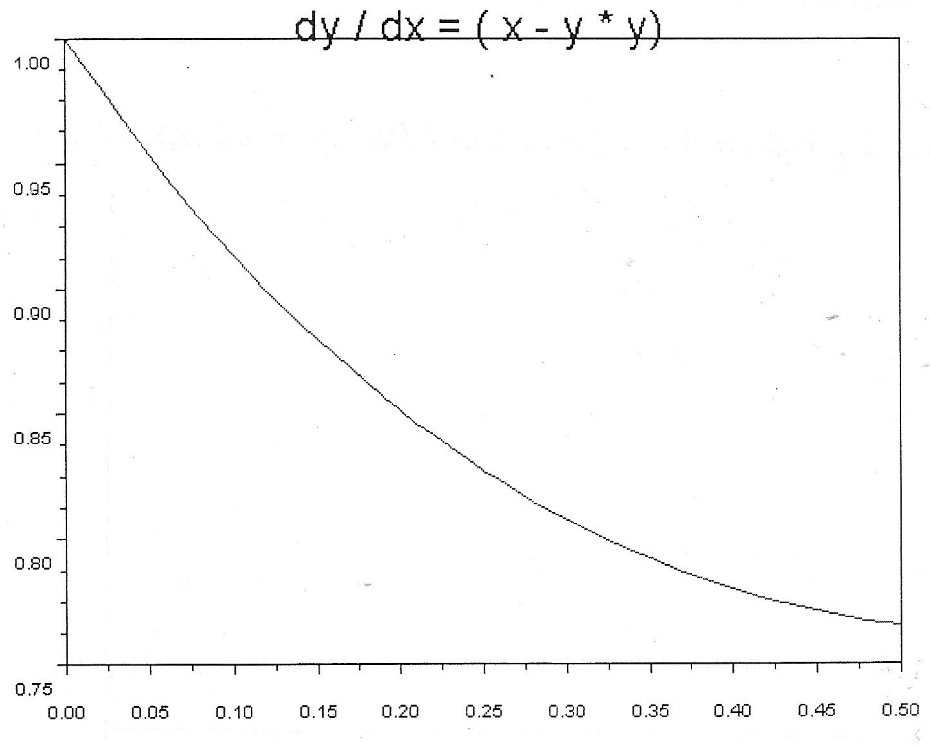
OUTPUT: y1 = 1.1960077, y2 = 1.375279



2) Solve $dy/dx=(x-y^2)$ given y(0)=1 and find y(0.1).

```
function ydot=f(x,y),
ydot=x-y^2, endfunction        //define the function dy/dx=(x-y^2)
y0=1;                          //specify the initial conditions
x0=0;                          //specify the initial conditions
x=0.1;                         //assign value of x at which y is to be evaluated
y=ode(y0,x0,x,f)               //function to solve the differential equation ydot
                               //with given initial conditions at x=0.1
x=0:.01:.5;            //populate x vector with values from 0 to 0.5 with an interval of 0.01
y=ode(y0,x0,x,f);      //Find y for all x ranging from 0 to 0.5
plot(x,y)              //plot y against x
title('dy / dx = ( x - y * y)','fontsize',5)     //Give the title to the plot with a font size of 5
```

<u>OUTPUT:</u> y = 0.9137944



Tutorial 3 – Double Integrals

1) Evaluate the integral f(x,y)=exp(3*x+4*y) over the region bounded by the lines x=0 , x=3 ; y=0 , y=4.

```
x=[0,0;3,3;3,0];        //form 3X2 matrix with abscissae of the vertices of the triangles in //the defined region
y=[0,0;4,4;0,4];        //form 3X2 matrix with ordinates of the vertices of the triangles in //the defined region
a=3; b=4;               //assign values for the constants a and b
deff('z=f(x,y)','z=(exp(a*x+b*y))')      //define the integrand as a function f(x,y)
[I,e]=int2d(x,y,f)                       //evaluate the definite integral and the estimated error
```

OUTPUT: e = 12.290477 ; I = 6.000D+09.

2) Evaluate the integral f(x,y)=1/((x^2)*(y^2)) over the region bounded by the lines x=2 , x=6 ; y=2 , y=4.

```
x=[2,2;6,6;6,2];        //form 3X2 matrix with abscissae of the vertices of the triangles in //the defined region
y=[2,2;4,4;2,4];        //form 3X2 matrix with ordinates of the vertices of the triangles in //he defined region
deff('z=f(x,y)','z=(1/((x^2)*(y^2)))')   //define the integrand as a function f(x,y)
[I,e]=int2d(x,y,f)                       //evaluate the definite integral and the estimated error
```

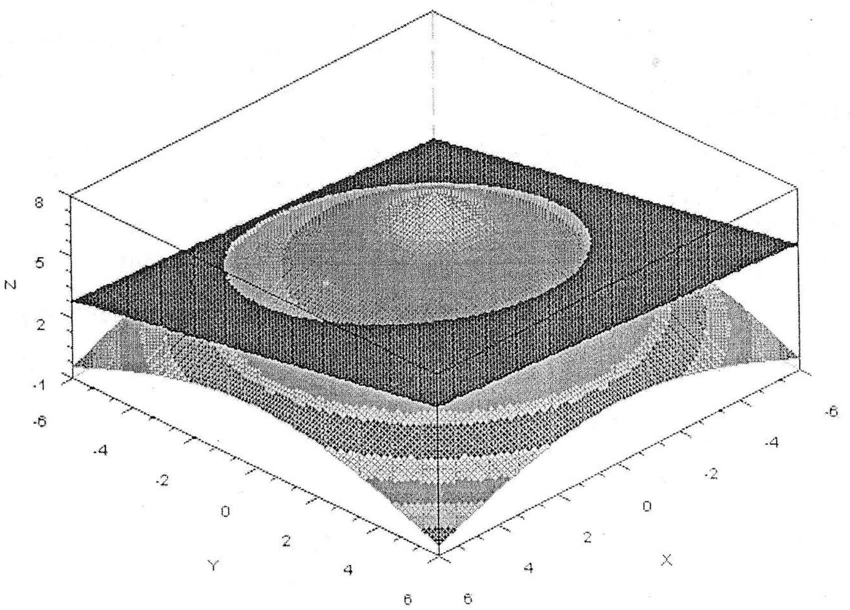
OUTPUT: e = 7.065D-11 ; I = 0.0833333

Tutorial 4 - Intersection of Surfaces

1) **Plot the surfaces defined by the cone $(8-z)^2 = x^2 + y^2$ and the plane $z=0.1x+0.3y+4$ and show their intersection.**

```
//Intersection of a conical surface and a plane to form an ellipse
//plot the conical surface
deff('z=f1(x,y)','z=8-sqrt(x^2+y^2)')    //define the function z=f1(x,y) as a conical surface
x=[-6:0.1:6];y=x ;                       //populate the vectors x and y
z=feval(x,y,f1);                         //evaluate matrix z as per f1(x,y) for every value of x & y
surf(x,y,z','edgecolor',[1 0 1],'facecolor',[1 0 1]); //plot z as a surface to show the conical surface
//plot the plane
deff('z=f2(x,y)','z=.1*x+.3*y+4')        //define the function z=f2(x,y) as a plane surface
x=[-6:0.1:6];y=x ;                       //populate the vectors x and y
e=gce()                                  //get the handle of graphics
e.color_mode =16;                        //set the color of the plot
fplot3d(x,y,f2);        //plot 3D graph of  function z=f2(x,y) to show the plane surface
```

OUTPUT:



2) **Plot the surfaces defined by the paraboloid $z = 0.5(x^2+y^2)$ and the sphere $x^2+y^2+z^2=4$ and show their intersection.**

//Plotting of paraboloid and sphere

```
deff('z=f1(x,y)','z=(x^2+y^2)/2')        // define the function z=f1(x,y) as a parabolic surface
deff('z=f2(x,y)','z=sqrt(-x^2-y^2+4)')   // define the function z=f1(x,y) as a spherical surface
x=-2:0.1:2 ;y=x ;                         //populate the vectors x and y
fplot3d(x,y,f1)        //plot 3D graph of function z=f1(x,y) to show the parabolic surface
e=gce()                                   //get the handle of graphics
e.color_mode =23;                         //set the color of the plot
fplot3d(x,y,f2)        //plot 3D graph of function z=f1(x,y) to show the spherical surface
```

OUTPUT: