MATLAB EXPERIMENT-8

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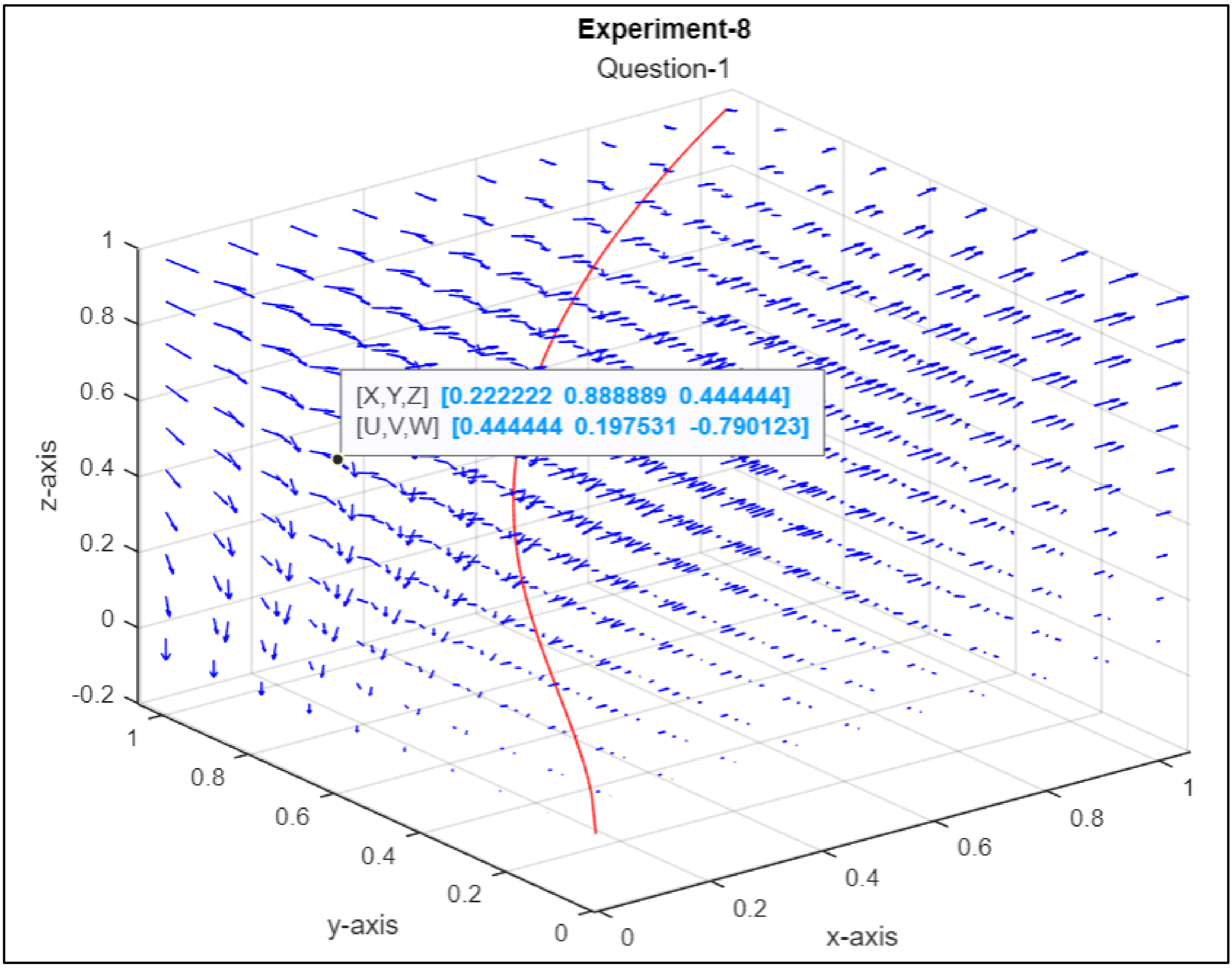
1) Evaluate $\int_C \mathbf{F} \cdot d\mathbf{r}$, where $\mathbf{F}(x, y, z) = z\mathbf{i} + xy\mathbf{j} - y^2\mathbf{k}$ along the curve C given by $\mathbf{r}(t) = t^2\mathbf{i} + t\mathbf{j} + \sqrt{t}\,\mathbf{k}$, $0 \le t \le 1$, and shown in Figure .

CODE:-

```
clc
clear
syms x y z t;
f=[z,x*y,-y^2];
r=[t^2,t,sqrt(t)];
l=0;
u=1;
G=[r(1),r(2),r(3)];
G1=diff(G,t);
F1=subs(subs(subs(f,x,r(1)),y,r(2)),z,r(3));
nf=F1.*G1;
nf1=nf(1)+nf(2)+nf(3);
I=double(int(nf1,t,l,u));
disp("The value of integral is ");
disp(I);
P=inline(f(1),'x','y','z');
Q=inline(f(2),'x','y','z');
R=inline(f(3),'x','y','z');
x=linspace(l,u,10);y=x;z=x;
[X,Y,Z]=meshgrid(x,y,z);
P1=P(X,Y,Z);Q1=Q(X,Y,Z);R1=R(X,Y,Z);
quiver3(X,Y,Z,P1,Q1,R1,1,'color','b');
title Experiment-8 Question-1;
xlabel("x-axis");
ylabel("y-axis");
zlabel("z-axis");
hold on
t=linspace(l,u);
X=eval(vectorize(G(1)));
Y=eval(vectorize(G(2)));
Z=eval(vectorize(G(3)));
plot3(X,Y,Z,'r');
```

OUTPUT:-



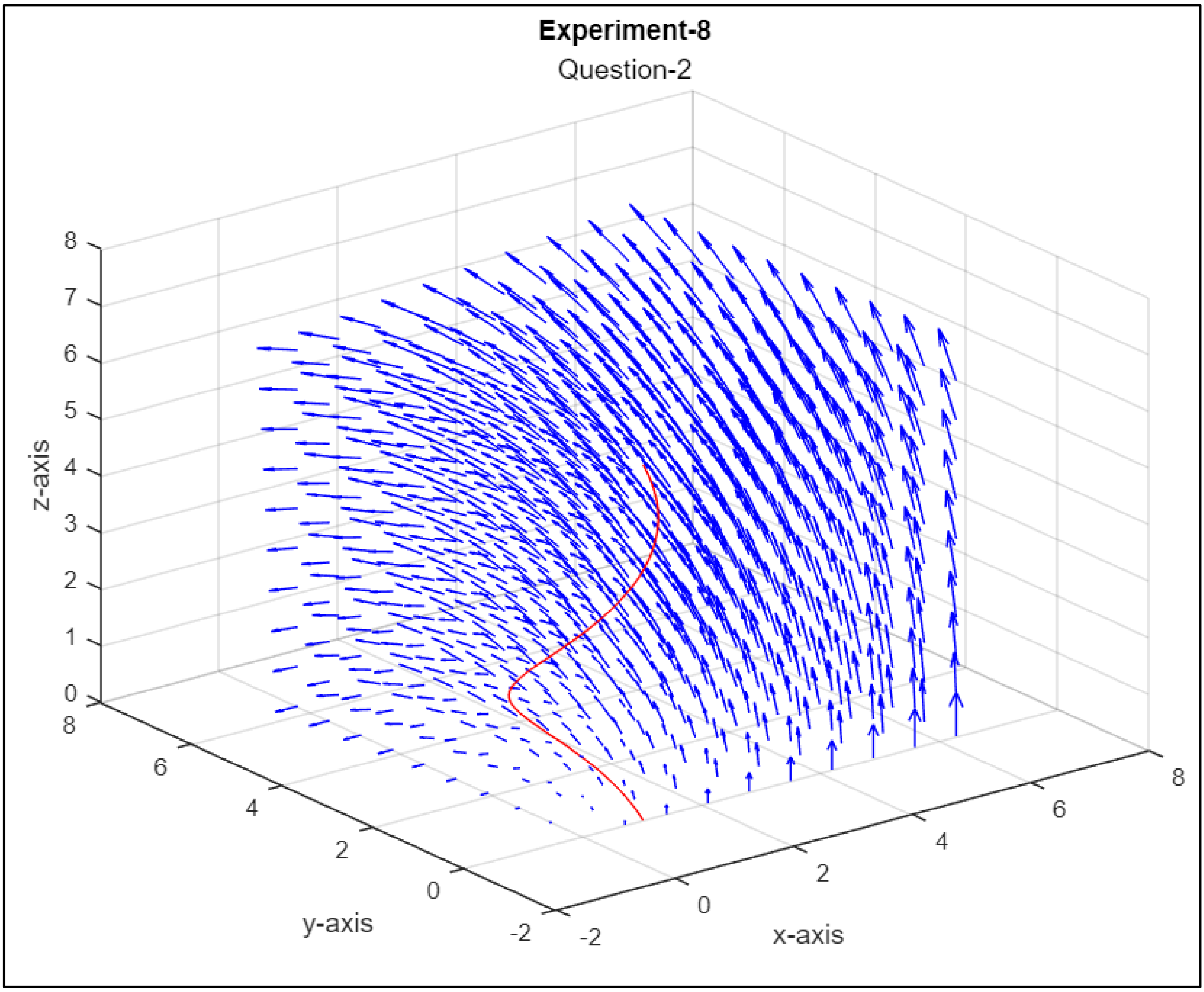

```
The value of integral is
     0.8500
```

Q2 Evaluate the line integral $\int_C -y\,dx + z\,dy + 2x\,dz$, where C is the helix $\mathbf{r}(t) = (\cos t)\mathbf{i} + (\sin t)\mathbf{j} + t\mathbf{k}, 0 \le t \le 2\pi$.

CODE:-

```
clc
clear
syms x y z t;
f=[-y,z,2*x];
r=[cos(t),sin(t),t];
l=0;
u=2*pi;
G=[r(1),r(2),r(3)];
G1=diff(G,t);
F1=subs(subs(subs(f,x,r(1)),y,r(2)),z,r(3));
nf=F1.*G1;
nf1=nf(1)+nf(2)+nf(3);
I=double(int(nf1,t,l,u));
disp("The value of integral is ");
disp(I);
P=inline(f(1),'x','y','z');
Q=inline(f(2),'x','y','z');
R=inline(f(3),'x','y','z');
x=linspace(l,u,10);y=x;z=x;
[X,Y,Z]=meshgrid(x,y,z);
P1=P(X,Y,Z);Q1=Q(X,Y,Z);R1=R(X,Y,Z);
quiver3(X,Y,Z,P1,Q1,R1,1.5,'color','b');
title Experiment-8 Question-2;
xlabel("x-axis");
ylabel("y-axis");
zlabel("z-axis");
hold on
t=linspace(l,u);
X=eval(vectorize(G(1)));
Y=eval(vectorize(G(2)));
Z=eval(vectorize(G(3)));
plot3(X,Y,Z,'r');
```

OUTPUT:-




```
The value of integral is
    3.1416
```

Find the work done for the force $\vec{F}(x,y,) = x^2\vec{i} + y^2\vec{j}$ along the arc of the parabola $y = 2x^2$ from (-1,2) to (2,8).

CODE:-

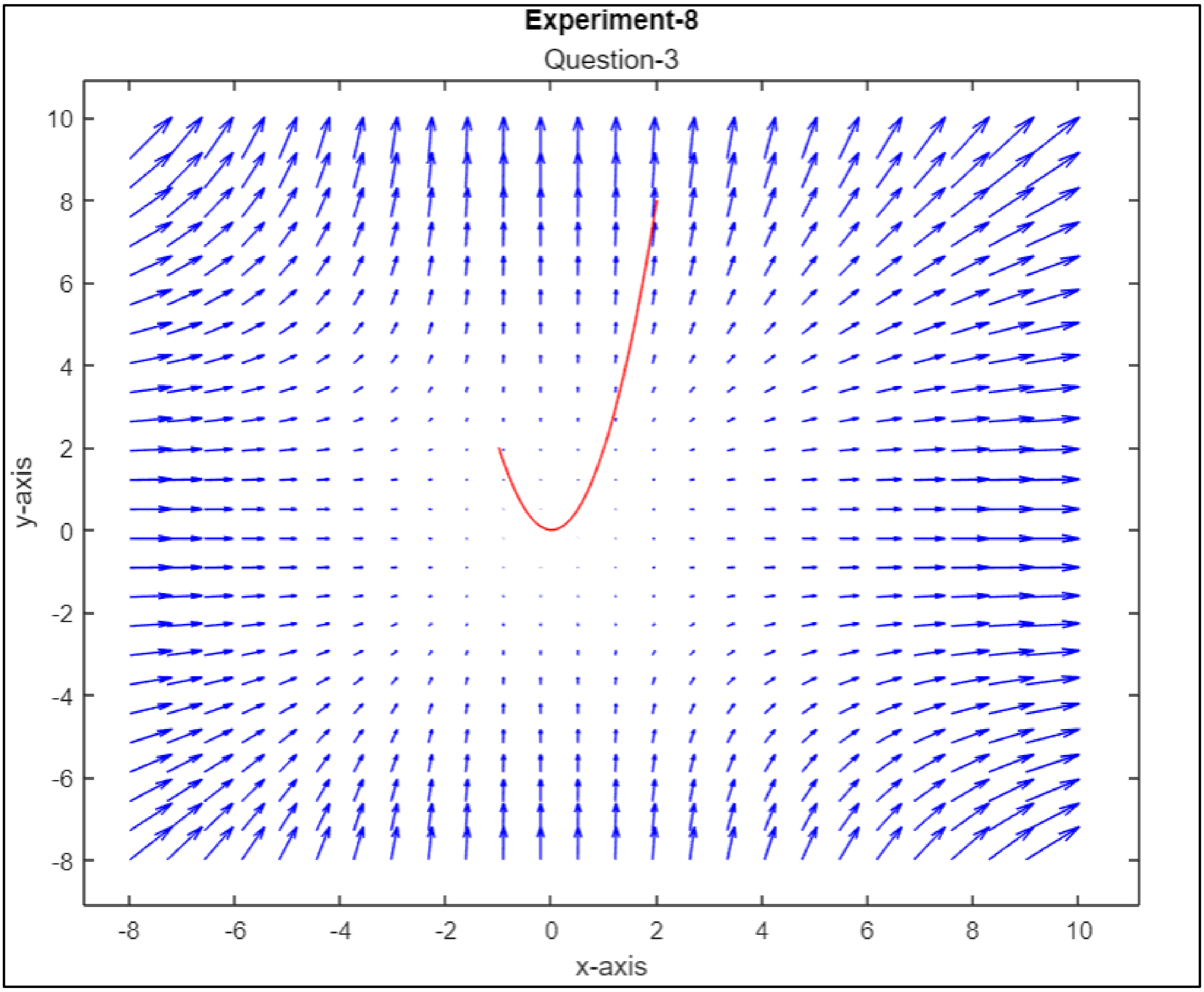
```
clc
clear
syms x y t;
f=[x^2,y^2];
r=[t,2*t^2];
l=-1;
u=2;
G=[r(1),r(2)];
G1=diff(G,t);
F1=subs(subs(f,x,r(1)),y,r(2));
nf=F1.*G1;
nf1=nf(1)+nf(2);
I=double(int(nf1,t,l,u));
disp("The value of integral is ");
disp(I);
P=inline(f(1),'x','y');
Q=inline(f(2),'x','y');
x=linspace(l-7,u+7,25);y=x;
[X,Y]=meshgrid(x,y);
P1=P(X,Y);Q1=Q(X,Y);
quiver(X,Y,P1,Q1,1.5,'color','b');
title Experiment-8 Question-3;
xlabel("x-axis");
ylabel("y-axis");


hold on
t=linspace(l,u);
X=eval(vectorize(G(1)));
Y=eval(vectorize(G(2)));
plot(X,Y,'r');
```

OUTPUT:-

COMMAND WINDOW

```
The value of integral is
   171
```



Show that the line integral is independent of path and evaluate the integral.

a) $\int_c \tan y \, dx + x \sec^2 y \, dy$ C is any path from (1,0) to $(2,\pi/4)$

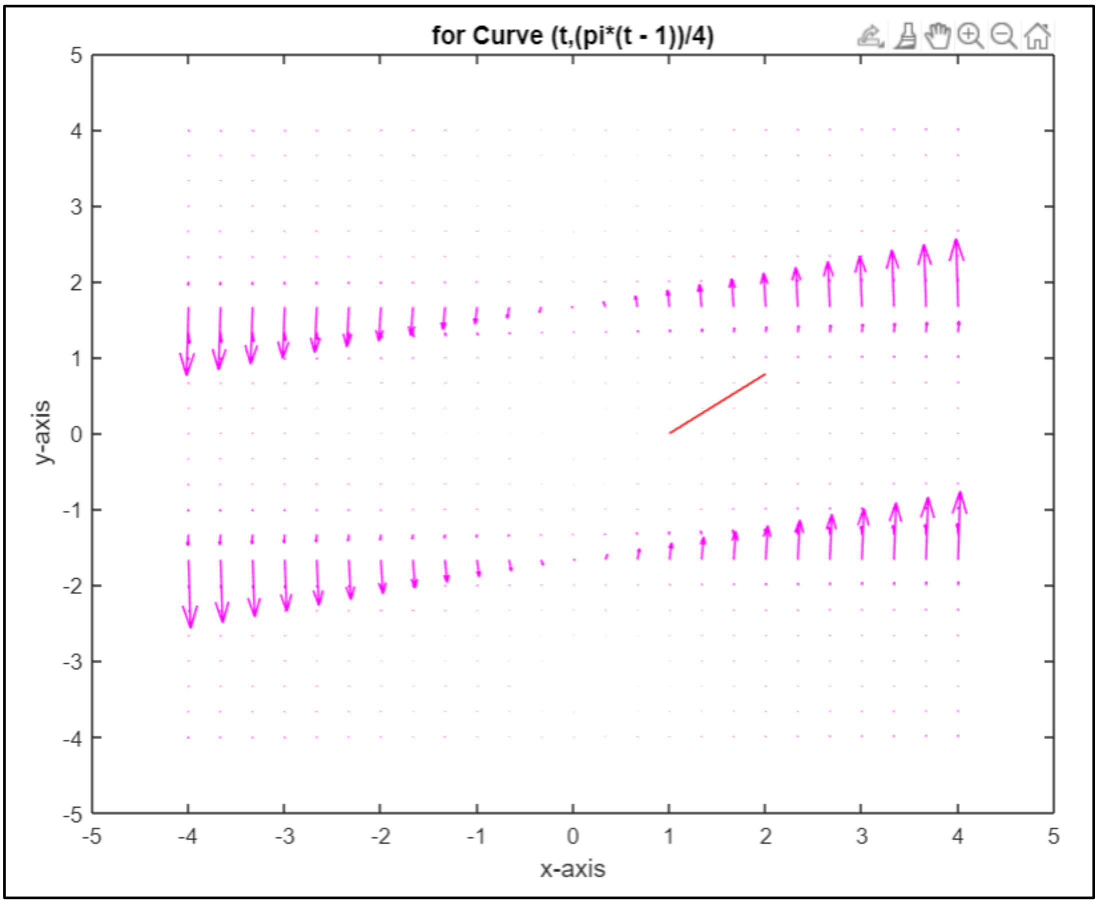
CODE:-

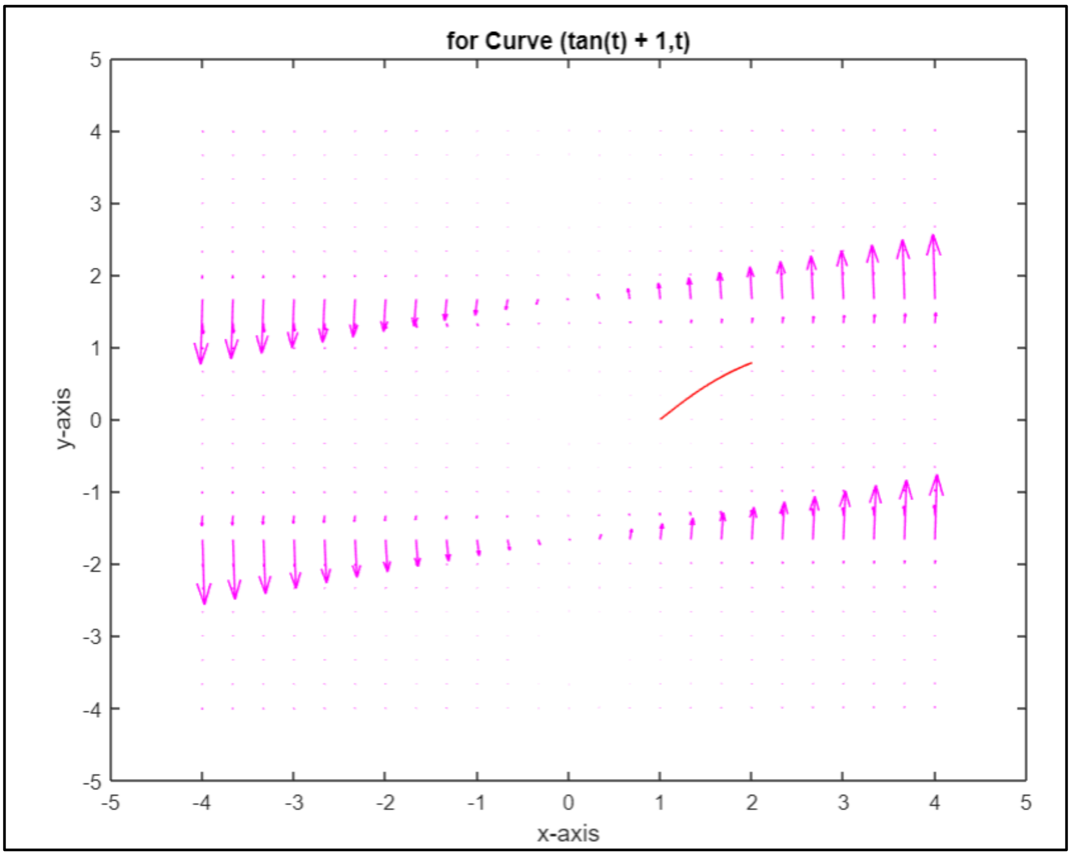
```
clc
clear
syms x y q t  real;
f=[tan(y),x*(sec(y))^2];
R=[t,(pi/4)*(t-1),tan(t)+1,t];
L=[1,0];
U=[2,pi/4];
I=[0 0];
s=1;
for i=1:2
    l=L(i);u=U(i);
    if i==2
        s=3;
    end
    r=[R(s),R(s+1)];
    disp("Along the curve");
    disp(r);
      G=[r(1),r(2)];G1=diff(G,t);
    nf=subs(subs(f,x,r(1)),y,r(2));
      nf1=nf.*G1;
      nf2=nf1(1)+nf1(2);
      I(i)=double(int(nf2,t,l,u));
    sprintf("Value of line integral along is %d",I(i))
      x1=linspace(-4,4,25);y1=x1;
      [X,Y]=meshgrid(x1,y1);
      a=inline(f(1),'x','y');
      b=inline(f(2),'x','y');
      A=a(X,Y);B=b(X,Y);
      figure
      quiver(X,Y,A,B,2,'color','m')
    xlabel("x-axis");
    ylabel("y-axis");
      title(sprintf("for Curve (%s,%s)",r));
      hold on
    if i==1
        g=subs(G,t,q);
           q=linspace(l,u);
           X=eval(vectorize(g(1)));
           Y=eval(vectorize(g(2)));
           plot(X,Y,'r');
    else
        t=linspace(l,u);
           X=eval(vectorize(G(1)));
           Y=eval(vectorize(G(2)));
```

```
            plot(X,Y,'r');
    end

end
if I(1)==I(2)
    sprintf("As line integral along both curves is %d,thus it is path independent",I(1))
else
    sprintf("Curve isn't path independent")
end
```

OUTPUT:-






```
Along the curve
[t, (pi*(t - 1))/4]


ans =

    "Value of line integral along is 2"

Along the curve
[tan(t) + 1, t]


ans =

    "Value of line integral along is 2"


ans =

    "As line integral along both curves is 2,thus it is path independent"
```