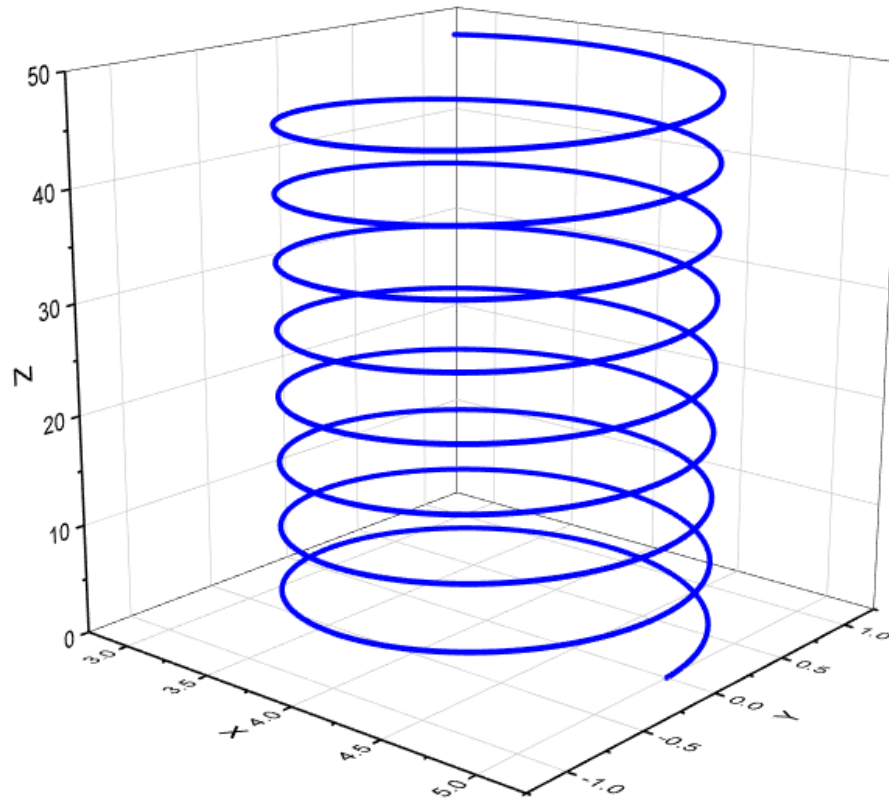


Electron Motion in magnetic field



```
#include<iostream>
#include<fstream>
#include<cmath>
float Bx;
float By;
float Bz;
const float q=-1.6;
const float m=9.1;
using namespace std;
float f1(float x,float y,float z,float vx,float vy,float vz,float t){
    return vx;
}
float f2(float x,float y,float z,float vx,float vy,float vz,float t){
    return vy;
}
float f3(float x,float y,float z,float vx,float vy,float vz,float t){
    return vz;
}
float f4(float x,float y,float z,float vx,float vy,float vz,float t){
    return (q/m)*(vy*Bz-vz*By);
}
float f5(float x,float y,float z,float vx,float vy,float vz,float t){
    return (q/m)*(vz*Bx-vx*Bz);
}
```

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}
float f6(float x,float y,float z,float vx,float vy,float vz,float t){
    return (q/m)*(vx*By-vy*Bx);
}

int main(){
    float T=10.0;
    float tau=0.001,t;
    int nmax=T/tau;
    int n;
    float
x[nmax+1],y[nmax+1],z[nmax+1],vx[nmax+1],vy[nmax+1],vz[nmax+1];
    float k1[6],k2[6],k3[6],k4[6];
    ofstream output ("mart4.txt");
    cout<<">>YASAMAN ZEHTAB MINOEI 401272166"<<'\\n';
    cout<<" { Electron motion in a magnetic field }"<<'\\n';
    cout<<"
    _____
    "<<'\\n';
    cout<<"please enter the magnetic field values..."<<'\\n';
    cout<<"Bx=";cin>>Bx;
    cout<<"By=";cin>>By;
    cout<<"Bz=";cin>>Bz;
    cout<<"
    _____
    "<<'\\n';
    cout<<"please enter initial location values..."<<'\\n';
    cout<<"x[0]=";cin>>x[0];
    cout<<"y[0]=";cin>>y[0];
    cout<<"z[0]=";cin>>z[0];
    cout<<"
    _____
    "<<'\\n';
    cout<<"please enter initial speed values..."<<'\\n';
    cout<<"vx[0]=";cin>>vx[0];
    cout<<"vy[0]=";cin>>vy[0];
    cout<<"vz[0]=";cin>>vz[0];

    for(n=0;n<nmax;n++){
        t=n*tau;
        k1[0]=f1(x[n],y[n],z[n],vx[n],vy[n],vz[n],t);
        k1[1]=f2(x[n],y[n],z[n],vx[n],vy[n],vz[n],t);
        k1[2]=f3(x[n],y[n],z[n],vx[n],vy[n],vz[n],t);
        k1[3]=f4(x[n],y[n],z[n],vx[n],vy[n],vz[n],t);
        k1[4]=f5(x[n],y[n],z[n],vx[n],vy[n],vz[n],t);
        k1[5]=f6(x[n],y[n],z[n],vx[n],vy[n],vz[n],t);

        k2[0]=f1(x[n]+0.5*tau*k1[0],y[n]+0.5*tau*k1[1],z[n]+0.5*tau*k1[2]
,vx[n]+0.5*tau*k1[3],vy[n]+0.5*tau*k1[4],vz[n]+0.5*tau*k1[5],t+0.5*tau
);

        k2[1]=f2(x[n]+0.5*tau*k1[0],y[n]+0.5*tau*k1[1],z[n]+0.5*tau*k1[2]

```

```
,vx[n]+0.5*tau*k1[3],vy[n]+0.5*tau*k1[4],vz[n]+0.5*tau*k1[5],t+0.5*tau
);
```

```
    k2[2]=f3(x[n]+0.5*tau*k1[0],y[n]+0.5*tau*k1[1],z[n]+0.5*tau*k1[2]
, vx[n]+0.5*tau*k1[3],vy[n]+0.5*tau*k1[4],vz[n]+0.5*tau*k1[5],t+0.5*tau
);
```

```
    k2[3]=f4(x[n]+0.5*tau*k1[0],y[n]+0.5*tau*k1[1],z[n]+0.5*tau*k1[2]
, vx[n]+0.5*tau*k1[3],vy[n]+0.5*tau*k1[4],vz[n]+0.5*tau*k1[5],t+0.5*tau
);
```

```
    k2[4]=f5(x[n]+0.5*tau*k1[0],y[n]+0.5*tau*k1[1],z[n]+0.5*tau*k1[2]
, vx[n]+0.5*tau*k1[3],vy[n]+0.5*tau*k1[4],vz[n]+0.5*tau*k1[5],t+0.5*tau
);
```

```
    k2[5]=f6(x[n]+0.5*tau*k1[0],y[n]+0.5*tau*k1[1],z[n]+0.5*tau*k1[2]
, vx[n]+0.5*tau*k1[3],vy[n]+0.5*tau*k1[4],vz[n]+0.5*tau*k1[5],t+0.5*tau
);
```

```
    k3[0]=f1(x[n]+0.5*tau*k2[0],y[n]+0.5*tau*k2[1],z[n]+0.5*tau*k2[2]
, vx[n]+0.5*tau*k2[3],vy[n]+0.5*tau*k2[4],vz[n]+0.5*tau*k2[5],t+0.5*tau
);
```

```
    k3[1]=f2(x[n]+0.5*tau*k2[0],y[n]+0.5*tau*k2[1],z[n]+0.5*tau*k2[2]
, vx[n]+0.5*tau*k2[3],vy[n]+0.5*tau*k2[4],vz[n]+0.5*tau*k2[5],t+0.5*tau
);
```

```
    k3[2]=f3(x[n]+0.5*tau*k2[0],y[n]+0.5*tau*k2[1],z[n]+0.5*tau*k2[2]
, vx[n]+0.5*tau*k2[3],vy[n]+0.5*tau*k2[4],vz[n]+0.5*tau*k2[5],t+0.5*tau
);
```

```
    k3[3]=f4(x[n]+0.5*tau*k2[0],y[n]+0.5*tau*k2[1],z[n]+0.5*tau*k2[2]
, vx[n]+0.5*tau*k2[3],vy[n]+0.5*tau*k2[4],vz[n]+0.5*tau*k2[5],t+0.5*tau
);
```

```
    k3[4]=f5(x[n]+0.5*tau*k2[0],y[n]+0.5*tau*k2[1],z[n]+0.5*tau*k2[2]
, vx[n]+0.5*tau*k2[3],vy[n]+0.5*tau*k2[4],vz[n]+0.5*tau*k2[5],t+0.5*tau
);
```

```
    k3[5]=f6(x[n]+0.5*tau*k2[0],y[n]+0.5*tau*k2[1],z[n]+0.5*tau*k2[2]
, vx[n]+0.5*tau*k2[3],vy[n]+0.5*tau*k2[4],vz[n]+0.5*tau*k2[5],t+0.5*tau
);
```

```
    k4[0]=f1(x[n]+tau*k3[0],y[n]+tau*k3[1],z[n]+tau*k3[2],vx[n]+tau*k
3[3],vy[n]+tau*k3[4],vz[n]+tau*k3[5],t+tau);
```

```
    k4[1]=f2(x[n]+tau*k3[0],y[n]+tau*k3[1],z[n]+tau*k3[2],vx[n]+tau*k
3[3],vy[n]+tau*k3[4],vz[n]+tau*k3[5],t+tau);
```

```

        k4[2]=f3(x[n]+tau*k3[0],y[n]+tau*k3[1],z[n]+tau*k3[2],vx[n]+tau*k
3[3],vy[n]+tau*k3[4],vz[n]+tau*k3[5],t+tau);

        k4[3]=f4(x[n]+tau*k3[0],y[n]+tau*k3[1],z[n]+tau*k3[2],vx[n]+tau*k
3[3],vy[n]+tau*k3[4],vz[n]+tau*k3[5],t+tau);

        k4[4]=f5(x[n]+tau*k3[0],y[n]+tau*k3[1],z[n]+tau*k3[2],vx[n]+tau*k
3[3],vy[n]+tau*k3[4],vz[n]+tau*k3[5],t+tau);

        k4[5]=f6(x[n]+tau*k3[0],y[n]+tau*k3[1],z[n]+tau*k3[2],vx[n]+tau*k
3[3],vy[n]+tau*k3[4],vz[n]+tau*k3[5],t+tau);

        x[n+1]=x[n]+tau/6.0*(k1[0]+2.0*k2[0]+2.0*k3[0]+k4[0]);
        y[n+1]=y[n]+tau/6.0*(k1[1]+2.0*k2[1]+2.0*k3[1]+k4[1]);
        z[n+1]=z[n]+tau/6.0*(k1[2]+2.0*k2[2]+2.0*k3[2]+k4[2]);
        vx[n+1]=vx[n]+tau/6.0*(k1[3]+2.0*k2[3]+2.0*k3[3]+k4[3]);
        vy[n+1]=vy[n]+tau/6.0*(k1[4]+2.0*k2[4]+2.0*k3[4]+k4[4]);
        vz[n+1]=vz[n]+tau/6.0*(k1[5]+2.0*k2[5]+2.0*k3[5]+k4[5]);

    }

    for(n=0;n<nmax;n++){
        t=n*tau;

output<<t<<'\t'<<x[n]<<'\t'<<y[n]<<'\t'<<z[n]<<'\t'<<vx[n]<<'\t'<<vy[n
]<<'\t'<<vz[n]<<'\n';
    }
    output.close();
    return 0;
}

```