

# 重力が向心力の円軌道の計算

$$x[i]=x[i]+v[i]*dt \quad \vec{x} = (x[0], x[1], x[2])$$

$$v[i]=v[i]+a[i]*dt \quad \vec{v} = (v[0], v[1], v[2])$$

$$R=(x[0]^2+x[1]^2+x[2]^2)^{1/2}$$

$$a[i]=-g*x[i]/R \quad \vec{a} = -g \frac{\vec{x}}{R} = \frac{-g}{R} (x[0], x[1], x[2])$$

$$i=0,1,2 \quad (x,y,z)$$

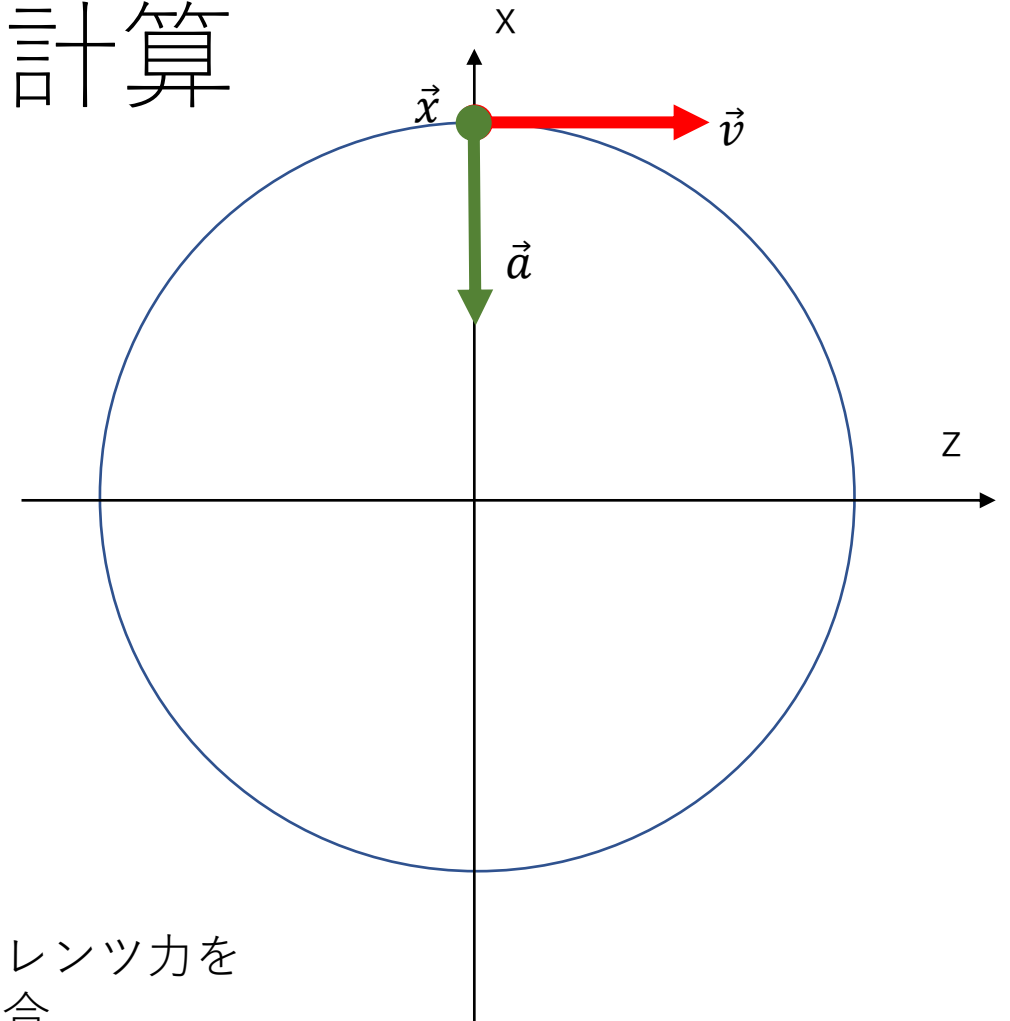
半径R、常に重力加速度gが掛かっているとき（今回はz-x平面の円運動を考える）、速度の絶対値 $v=\sqrt{gR}$

$$mg = m \frac{v^2}{R}$$

重力

(向心力)

遠心力



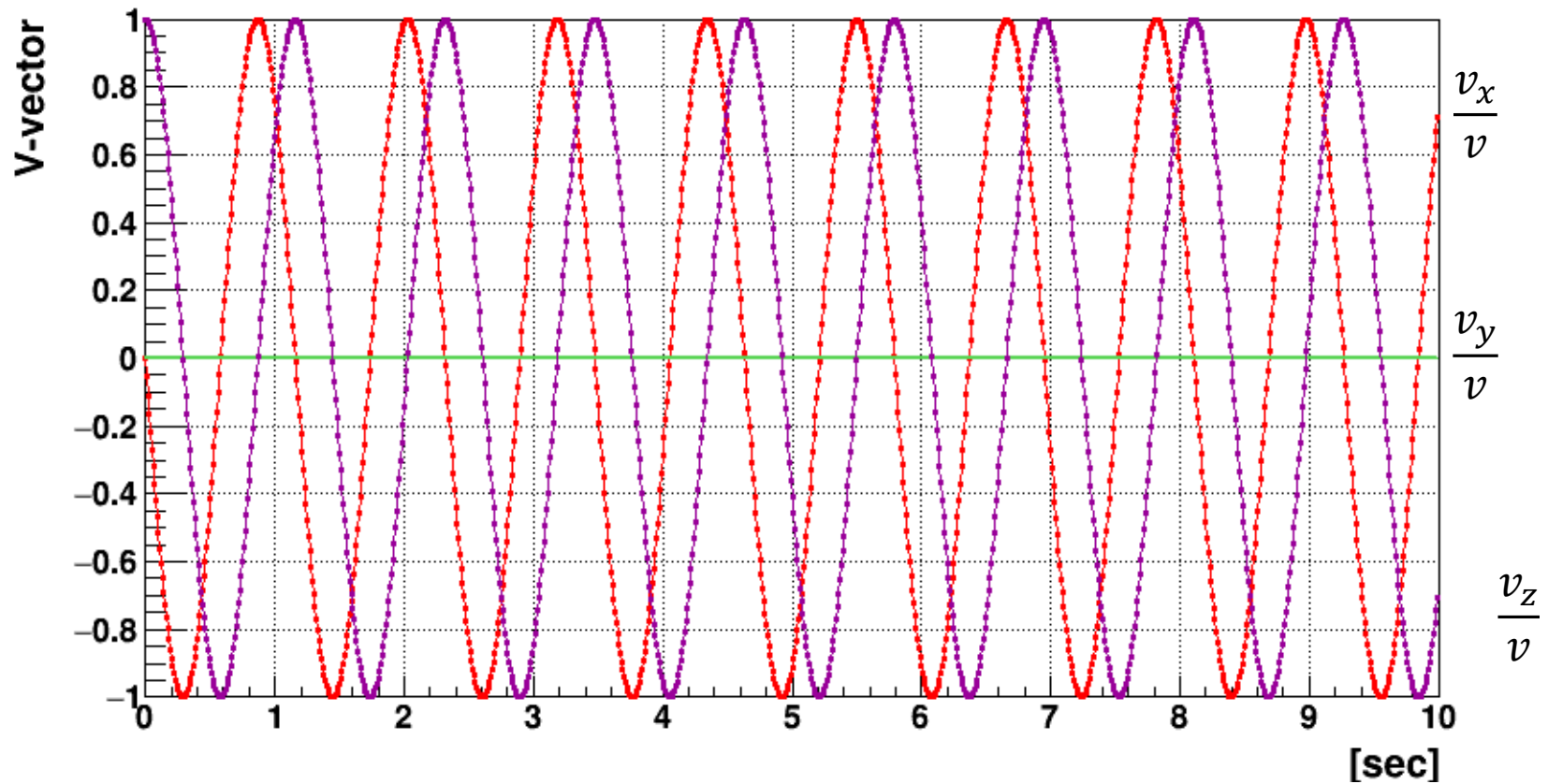
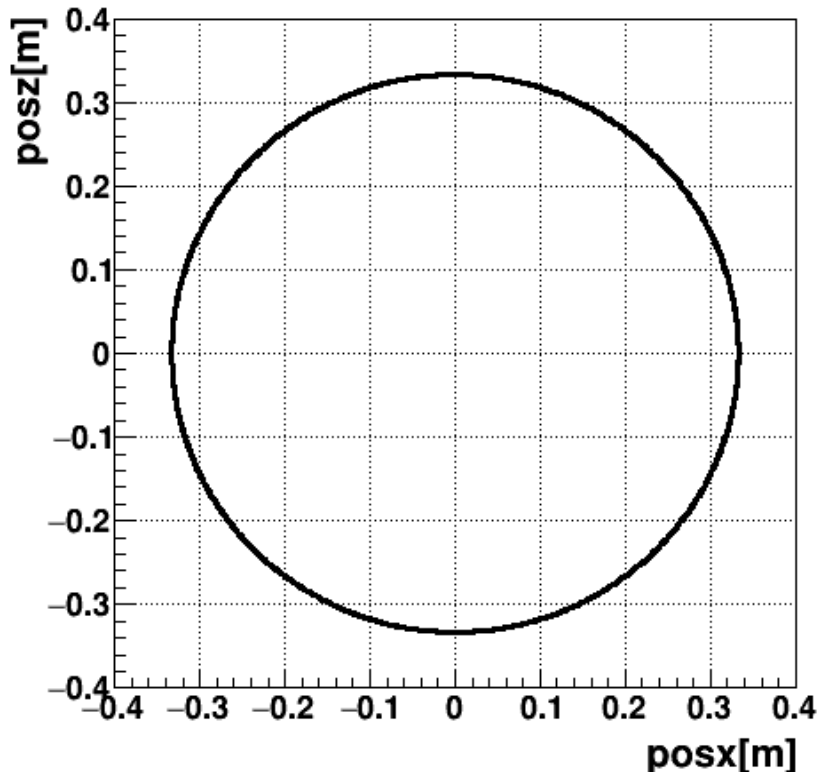
次のステップ

均一磁場のローレンツ力を  
向心力にする場合、

$$\vec{a} = \frac{q}{m} \vec{v} \times \vec{B}$$

確認ポイント

$x, z, v_x/v, v_z/v$ が $\sin, \cos$ の時間の関数になっているか？



# 添付のtestCircle.txt の中身

時刻[sec], x[m],y[m],z[m], vx[m/s],vy[m/s],vz[m/s]

```
0.000000e+00,3.330000e-01,0.000000e+00,1.806488e-04,-9.800000e-04,0.000000e+00,1.806488e+00
1.000000e-02,3.325003e-01,0.000000e+00,1.823640e-02,-9.893048e-02,0.000000e+00,1.803777e+00
2.000000e-02,3.310223e-01,0.000000e+00,3.623850e-02,-1.965899e-01,0.000000e+00,1.795760e+00
3.000000e-02,3.285704e-01,0.000000e+00,5.413398e-02,-2.936709e-01,0.000000e+00,1.782458e+00
4.000000e-02,3.251518e-01,0.000000e+00,7.187019e-02,-3.898878e-01,0.000000e+00,1.763913e+00
5.000000e-02,3.207765e-01,0.000000e+00,8.939493e-02,-4.849577e-01,0.000000e+00,1.740177e+00
6.000000e-02,3.154574e-01,0.000000e+00,1.066567e-01,-5.786006e-01,0.000000e+00,1.711322e+00
7.000000e-02,3.092101e-01,0.000000e+00,1.236046e-01,-6.705412e-01,0.000000e+00,1.677431e+00
8.000000e-02,3.020531e-01,0.000000e+00,1.401888e-01,-7.605089e-01,0.000000e+00,1.638605e+00
9.000000e-02,2.940074e-01,0.000000e+00,1.563606e-01,-8.482390e-01,0.000000e+00,1.594958e+00
1.000000e-01,2.850967e-01,0.000000e+00,1.720723e-01,-9.334735e-01,0.000000e+00,1.546618e+00
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