In[]:=
```
v1 = 334;
G = 6.75 * Power[10, -11];
M = 5.965 * Power[10, 24];
w = 2 * Pi / 24 / 3600;
R = 6371000;
time = 70;
latitude = Pi / 6;
eqns = {z''[t] == -z[t] * G * M / (z[t]^2 + y[t]^2)^(3/2),
  y''[t] == -y[t] * G * M / (z[t]^2 + y[t]^2)^(3/2), z[0] == 0,
  y[0] == R, z'[0] == w * R * Cos[latitude], y'[0] == 334}
```

Out[]=
$$\left\{z''[t] == -\frac{4.02638 \times 10^{14}\, z[t]}{\left(y[t]^2 + z[t]^2\right)^{3/2}},\ y''[t] == -\frac{4.02638 \times 10^{14}\, y[t]}{\left(y[t]^2 + z[t]^2\right)^{3/2}},\right.$$
$$\left. z[0] == 0,\ y[0] == 6371000,\ z'[0] == \frac{31855\,\pi}{144\sqrt{3}},\ y'[0] == 334\right\}$$

In[]:=
```
s = NDSolve[eqns, {y[t], z[t]}, {t, 0, time}]
```

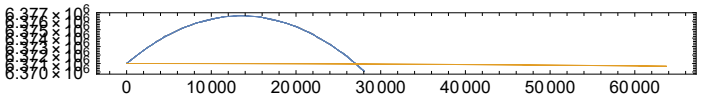
Out[]=
$$\{\{y[t] \to \text{InterpolatingFunction}[\ \text{Domain: } \{\{0., 70.\}\}\ \text{Output: scalar}\ ][t],$$
$$z[t] \to \text{InterpolatingFunction}[\ \text{Domain: } \{\{0., 70.\}\}\ \text{Output: scalar}\ ][t]\}\}$$

In[]:=
```
ss = N[DSolve[eqns, {z, y}, {t, 0, 70}]]
```

Out[]=
$$\{\{z \to \text{InterpolatingFunction}[\ \text{Domain: } \{\{0., 70.\}\}\ \text{Output: scalar}\ ],$$
$$y \to \text{InterpolatingFunction}[\ \text{Domain: } \{\{0., 70.\}\}\ \text{Output: scalar}\ ]\}\}$$

In[]:=
```
ParametricPlot[{Evaluate[{z[t], y[t]} /. s], {R * Cos[u], R * Sin[u]}},
  {t, 0, time}, {u, Pi / 2 - 0.01, Pi / 2}]
```

Out[•]=



In[•]:=
```
f[x_] = Sqrt[Evaluate[z[t] /. s]^2 + Evaluate[y[t] /. s]^2] - R;
```
… 计算 计算

In[•]:=
```
Plot[f[t], {t, 67, time}]
```
绘图

In[•]:=
```
Plot[f[t], {t, 0, time}, PlotPoints → 75, MaxRecursion → 5]
```
绘图 绘图点 最大递推

In[•]:=
```
NSolve[f[t] == 0 && t > 0 && t < 100, t, Reals]
```
数值求解 实数域

In[•]:=
```
y[67.65] /. s
```

In[•]:=
```
t := 67.65;
bbb := Evaluate[z[t] /. s];
```
计算

```
ccc := Evaluate[y[t] /. s];
```
计算

```
(Pi / 2 - ArcTan[bbb, ccc]) / w
```
圆周率 反正切

Out[•]=
```
{67.5701}
```

In[•]:=
```
g[t_] := Sqrt[(Evaluate[z[t] /. s] - R * Cos[Pi / 2 - w * t]) * 2 +
```
平方根 计算 余弦 圆周率

```
    (Evaluate[y[t] /. s] - R * Sin[Pi / 2 - w * t]) * 2];
```
计算 正弦 圆周率

In[•]:=
```
Plot[g[t], {t, 50, 60}]
```
绘图

Out[•]=