In [24]:
```
import math
import sympy as sym
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
%matplotlib inline
```

In [25]:
```
h = sym.Symbol('h') # heigth
r = sym.Symbol('r') # Radius
pi = sym.Symbol('pi') # pi number = 3.14
v = sym.Symbol('v') # volume
```

In [26]:
```
# volume formule for Cylinders tank

Cyl_V = pi * (r ** 2) * h
Cyl_V
```

Out[26]: $h\pi r^{2}$

In [27]:
```
# Area forlmula for Cylinders tank

Area_Floor = pi * (r ** 2)
Area_Ceil  = pi * (r ** 2)
Area_Wall = pi * 2 * r * h

Area_total = Area_Floor + Area_Ceil + Area_Wall
Area_total
```

Out[27]: $2h\pi r + 2\pi r^{2}$

In [28]:
```
#our targer is 1 milion barrel oil tank

#converting 1 milion barrel oil to cubic meter

# 1 barrel oil = 158.987 L
# 1000 L = 1 m^3

target_v = (10 ** 6) * 158.987 * (10**-3)

print('target volume is {} '.format(target_v))
```

```
target volume is 158987.0
```

In [29]:
```
# definig h according to v and r

h_v_r = v/(pi * (r ** 2))
h_v_r
```

Out[29]: $\frac{v}{\pi r^{2}}$

In [31]:
```
# Area accorind to v and r

A_v_r = Area_total.subs(h, h_v_r)
A_v_r
```

Out[31]: $2\pi r^{2} + \frac{2v}{r}$

In [33]:
```
# drevitive A according to r

dAdr = sym.diff(A_v_r, r)
dAdr
```

Out[33]: $4\pi r - \frac{2v}{r^{2}}$

In [58]:
```
# finding the best r for minimum Area
# R = best R
l = list(sym.solveset(dAdr.subs(v, target_v).subs(pi,math.pi), r))
R = l[0]
R
```

Out[58]: 29.3580529015881

In [80]:
```
H = h_v_r.subs(r,R).subs(v, target_v).subs(pi, math.pi)
H
```

Out[80]: 58.7161058031762

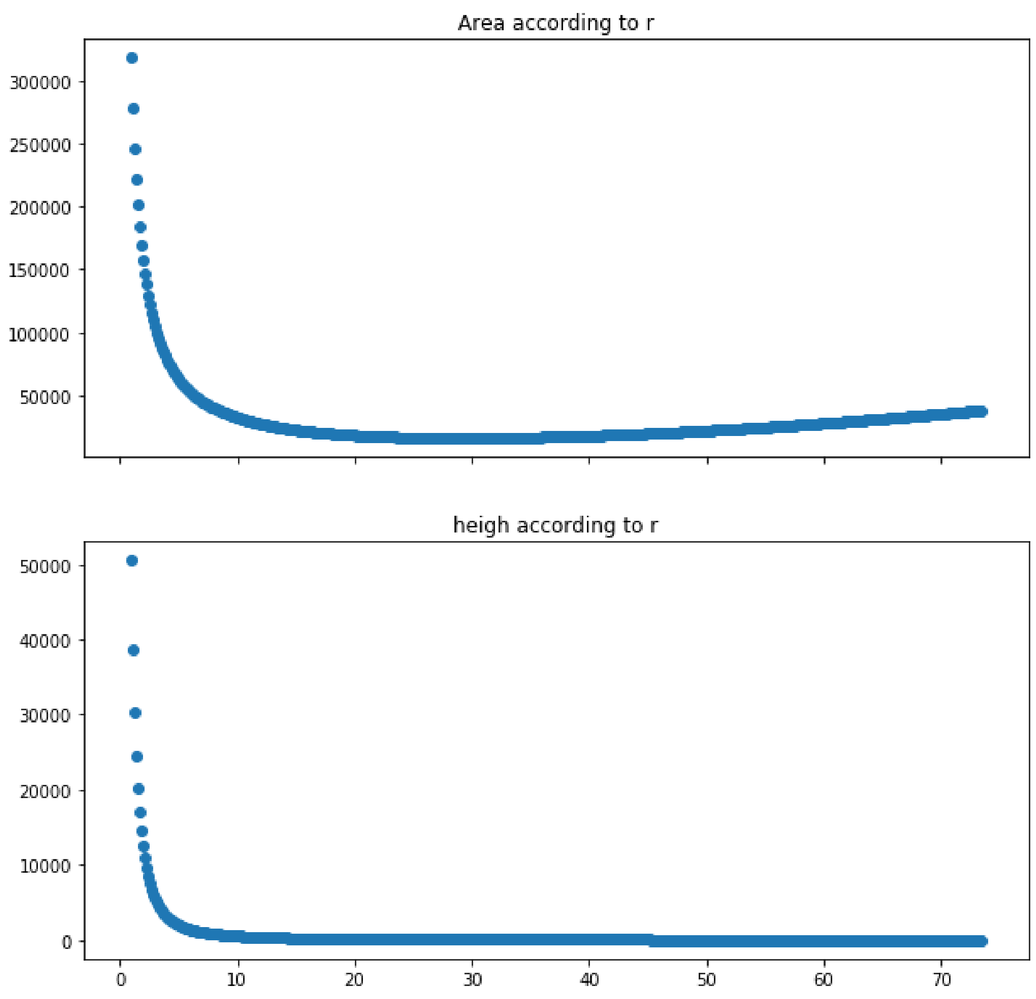
In [68]:
```
# ploting Area and heigh according to r
Rs = np.linspace(1, 2.5*float(R), 500)
df = pd.DataFrame({'r':Rs})
df['h'] = df['r'].apply(lambda x: h_v_r.subs(r,x).subs(v, target_v).subs(pi, math.pi))
df['A_t'] = df['r'].apply(lambda x: A_v_r.subs(r,x).subs(v, target_v).subs(pi, math.pi))
```

In [78]:
```
fig,(ax1,ax2) = plt.subplots(2,1,sharex=True,figsize=(10,10))

ax1.set_title('Area according to r')
ax1.scatter(df['r'], df['A_t'])

ax2.set_title('heigh according to r')
ax2.scatter(df['r'], df['h'])
```

Out[78]: <matplotlib.collections.PathCollection at 0x164f0e70>



In [ ]: