In [1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from mpl_toolkits.mplot3d import Axes3D
```

In [2]:
```
import os
#help(os.listdir)
#path=(os.getcwd())
print(os.listdir("C:\\Users\\abc\\Desktop\\input"))
```

```
['ex1data1.txt', 'ex1data2.txt']
```

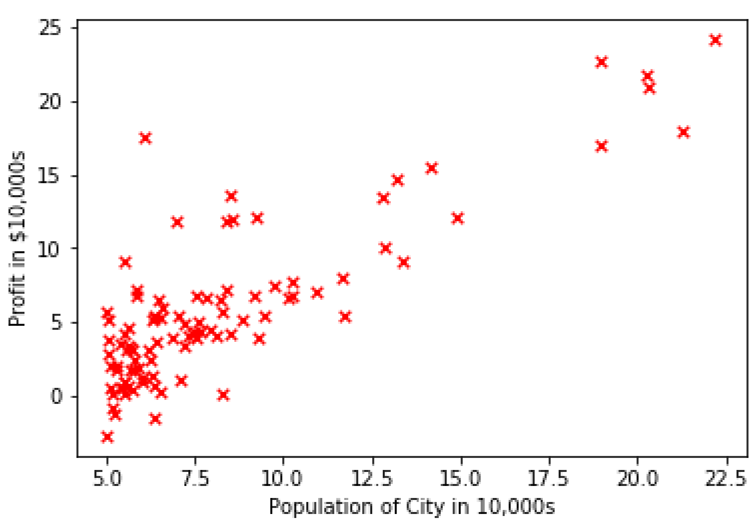
In [3]:
```
data=pd.read_csv("input\\ex1data1.txt", header=None) #read from dataset
#print(data)
X=data.iloc[:,0] #read first column
y=data.iloc[:,1] #read second column
m=len(y)

data.head()
```

Out[3]:

	0	1
0	6.1101	17.5920
1	5.5277	9.1302
2	8.5186	13.6620
3	7.0032	11.8540
4	5.8598	6.8233

In [4]:
```
#Plot Data
plt.scatter(X,y,marker='x',s=30,c='red')
plt.xlabel('Population of City in 10,000s')
plt.ylabel('Profit in $10,000s')
plt.show()
```



In [5]:

```
X=X[:,np.newaxis]
y=y[:,np.newaxis]
theta=np.zeros((2,1))
iterations=1500
alpha= 0.01
ones=np.ones((m,1))
X=np.hstack((ones,X))
# print(theta)
# print(X)
```

In [6]:

```
def computeCost(X,y,theta):
    temp=np.dot(X,theta)-y
    return sum(np.power(temp,2))/(2*m)
J=computeCost(X,y,theta)
print(J)
```

```
[32.07273388]
```

In [7]:

```
def gradientDescent(X,y,theta,alpha,iterations):
    for _ in range(iterations):
        temp = np.dot(X,theta)-y
        temp = np.dot(X.T,temp)
        theta=theta - (alpha/m) * temp
    return theta
theta=gradientDescent(X,y,theta,alpha,iterations)
print(theta)
```

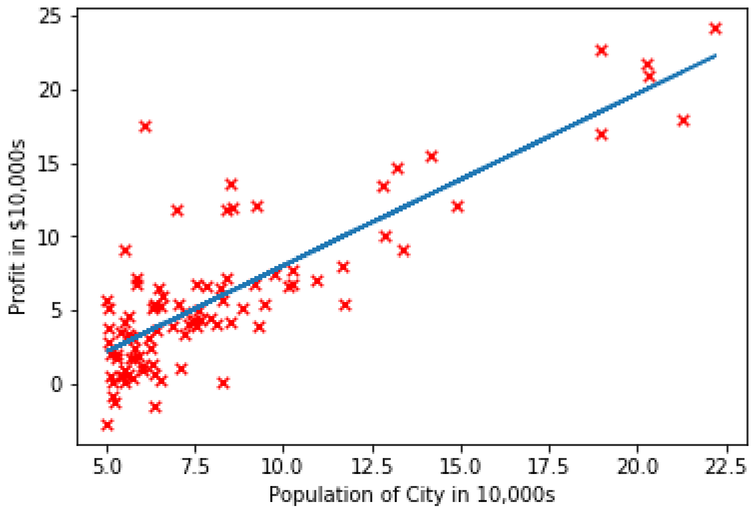
```
[[-3.63029144]
 [ 1.16636235]]
```

In [8]:

```
J=computeCost(X,y,theta);
print(J)
```

```
[4.48338826]
```

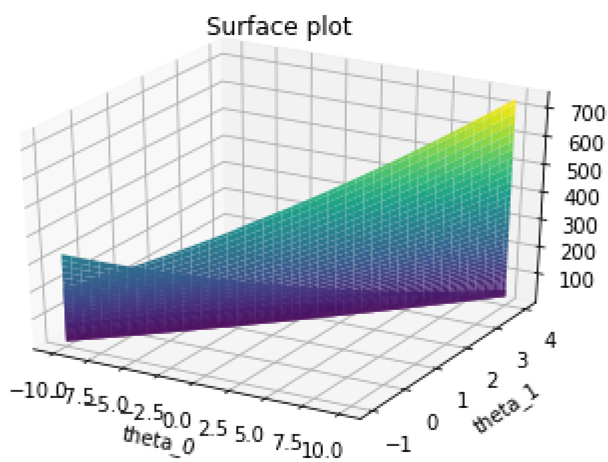
In [9]:
```
#Plot showing the best fit line
plt.scatter(X[:,1],y,s=30,marker='x',c='red')
plt.xlabel('Population of City in 10,000s')
plt.ylabel('Profit in $10,000s')
plt.plot(X[:,1],np.dot(X,theta)) #plot(x,y)...y=theta0+theta1*x1
plt.savefig('graph.png')
plt.show()
```



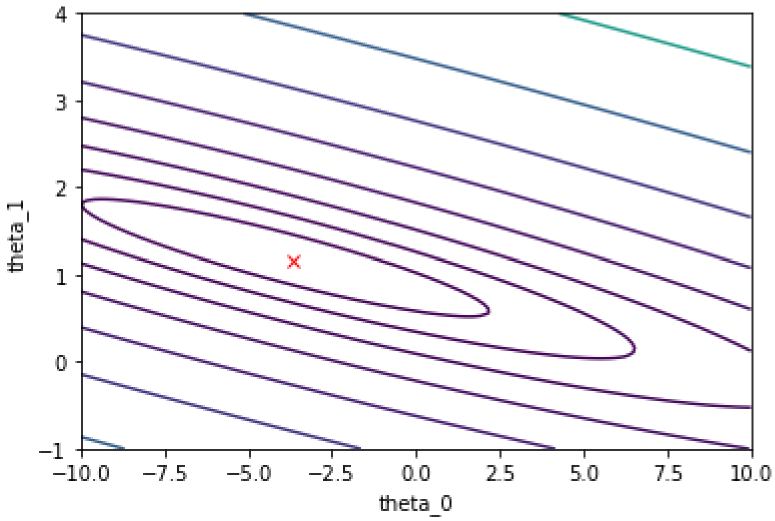
In [10]:
```
# visualising J(theta0, theta1 )
theta0_vals = np.linspace(-10, 10, 100)
theta1_vals = np.linspace(-1, 4, 100)
J_vals = np.zeros( ( len(theta0_vals), len(theta1_vals) ) )
t=np.zeros((2,1))
for i in range(len(theta0_vals)):
    for j in range(len(theta1_vals)):
        t[0]=theta0_vals[i]
        t[1]=theta1_vals[j]
        J_vals[i,j]=computeCost(X,y,t)
J_vals=J_vals.T
#fig = plt.figure()

ax = plt.axes(projection='3d')

ax.plot_surface(theta0_vals,theta1_vals,J_vals,cmap='viridis', edgecolor='non
e')
ax.set_title('Surface plot')
plt.xlabel('theta_0'); plt.ylabel('theta_1');
plt.show()
```



In [11]:
```
#contour plot
plt.contour(theta0_vals, theta1_vals, J_vals, np.logspace(-2, 3, 20))
plt.xlabel('theta_0'); plt.ylabel('theta_1');
#plt.hold(true);
plt.plot(theta[0], theta[1],c='red',marker='x');
```



In [ ]: