PRÁCTICA 2.2 - VÍCTOR CHOZA MERINO - ADRIÁN TURIEL CHARRO

Ver como usar plot_decisionboundary

Type *Markdown* and LaTeX: α^2

2. Regresión logística regularizada

In [1]:

```
import matplotlib.pyplot as plt
import numpy as np
from pandas.io.parsers import read_csv
import scipy.optimize as opt
from sklearn.preprocessing import PolynomialFeatures
```

In [2]:

```
def sigmoide(z): #g(z)
    return (1 / (1 + np.exp(-z)))
```

In [3]:

```
def gradiente(Thetas, X, Y, lambdaa):
    H = sigmoide(np.matmul(X, Thetas))   #Hipótesis
    return np.matmul(X.T, H - Y)*(1/len(X)) + (lambdaa/len(X))*Thetas
```

In [4]:

```
def coste(Thetas, X, Y, lambdaa):
    H = sigmoide(np.matmul(X, Thetas))
    m = len(X)
    # Thetas[1:] xq el prim valor no nos interesa
    sumatorioTheta = sum(np.power(Thetas[1:],2))
    return (- 1 / m) * (np.dot(Y, np.log(H)) + np.dot((1 - Y),
                        np.log(1 - H))) +  (lambdaa/2*m) * sumatorioTheta
```

In [6]:

```
def plot_decisionboundary(X, Y, theta, poly):
    plt.figure()

    x1_min, x1_max = X[:, 0].min(), X[:, 0].max()
    x2_min, x2_max = X[:, 1].min(), X[:, 1].max()

    xx1, xx2 = np.meshgrid(np.linspace(x1_min, x1_max),np.linspace(x2_min, x2_max))

    h = sigmoide(poly.fit_transform(np.c_[xx1.ravel(), xx2.ravel()]).dot(theta))
    h = h.reshape(xx1.shape)

    # Obtiene un vector con los índices de los ejemplos positivos
    pos1 = np.where(Y == 1)
    # Obtiene un vector con los índices de los ejemplos negativos
    pos2 = np.where(Y == 0)


    # Dibuja los ejemplos positivos
    plt.scatter(X[pos1, 0],X[pos1, 1],marker='+',c='k',label='Admited' )
    # Dibuja los ejemplos negativos
    plt.scatter(X[pos2, 0],X[pos2, 1],marker='o',c='g',label='Not admited'  )

    plt.contour(xx1, xx2, h, [0.5], linewidths=1, colors='g')
    plt.savefig("boundary.pdf")
    plt.show()
    plt.close()
```

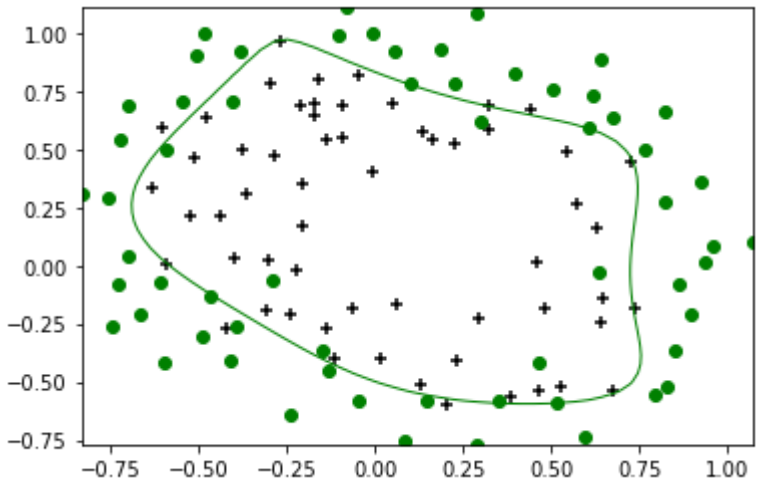
In [13]:

```
def regresion_logistica_regularizada(datos,lambdas):
    valores = read_csv(datos, header=None).to_numpy()

    X = valores[:,:-1]
    Y = valores[:,-1]

    m = np.shape(X)[0]   #Filas
    n = np.shape(X)[1]   #Columnas

    # Para PolynomialFeatures(2), con [a, b, c]
    # obtenemos [1, a, b, c, a^2, b^2, c^2, ab, bc, ca]
    # Para PolynomialFeatures(6), obtenemos 28 combinaciones
    poly = PolynomialFeatures(6)

    X_Poly = poly.fit_transform(X)
    Thetas = np.zeros(len(X_Poly[1]))

    for l in lambdas:
        print("Lambda: ", l)
        result = opt.fmin_tnc (func=coste , x0=Thetas ,
                               fprime=gradiente , args =(X_Poly, Y, l))
        Thetas = result [0]

        plot_decisionboundary(X, Y, Thetas, poly)
        print("-----------------------------------------------------")
```

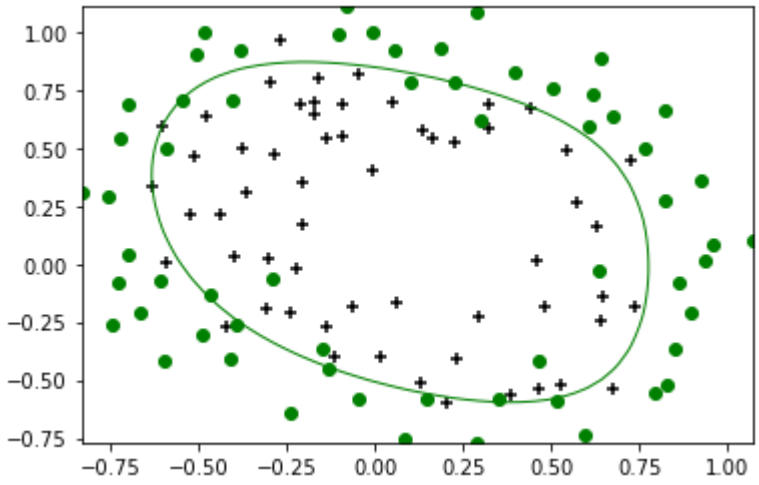
In [17]:

```
lambdas = np.array([0.0000001, 0.1, 1, 10, 100])
regresion_logistica_regularizada("ex2data2.csv",lambdas)
```

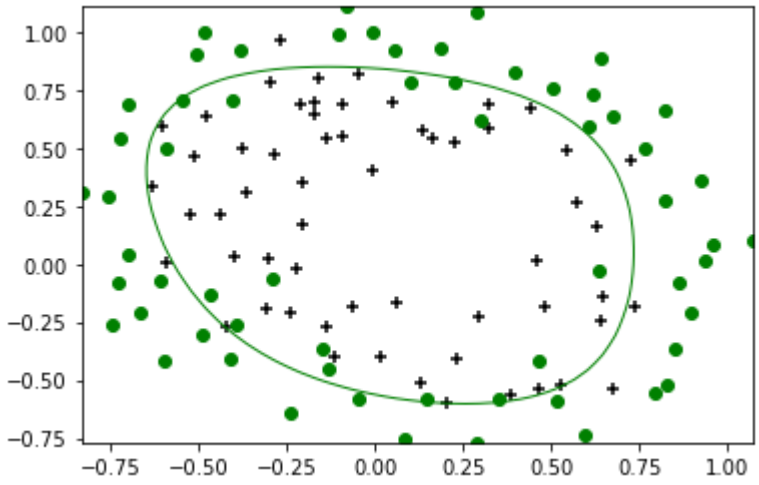
```
Lambda:  1e-07
```



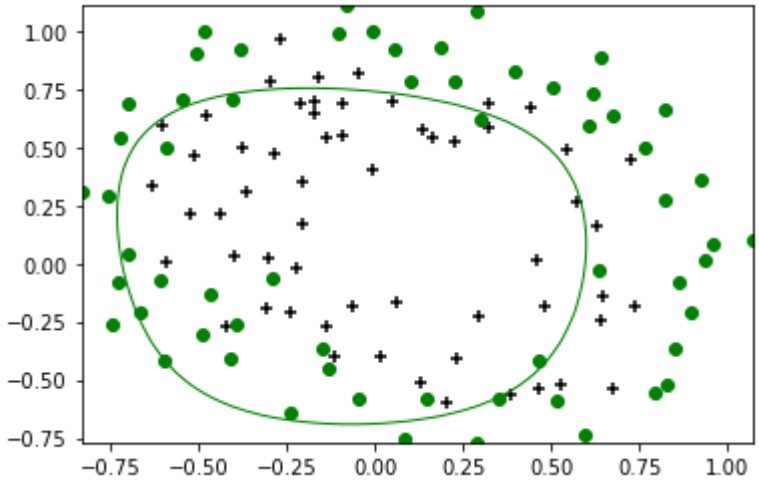

```
----------------------------------------------------------
Lambda:  0.1
```



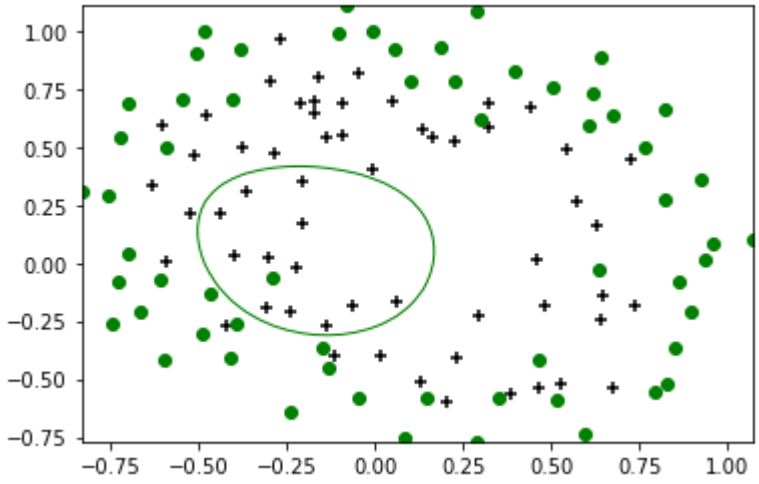

```
----------------------------------------------------------
Lambda:  1.0
```



Lambda: 10.0



Lambda: 100.0



In [ ]:

```
1
```