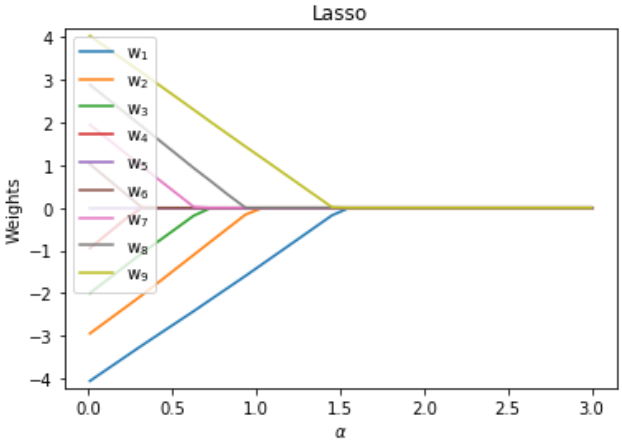
Problem 3

Use this notebook to write your code for problem 3.

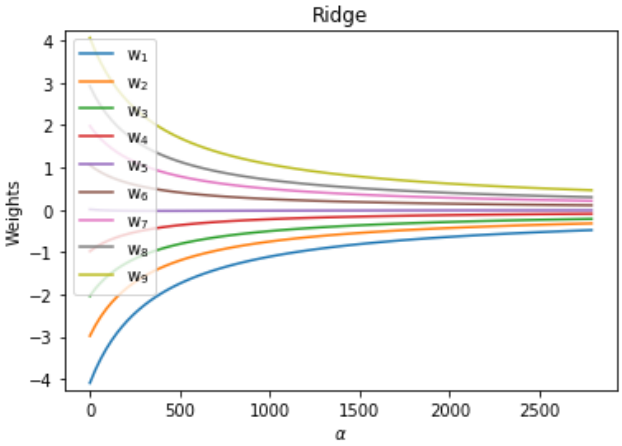
In [26]:
```
import numpy as np
from matplotlib import pyplot as plt
from sklearn.linear_model import Ridge
from sklearn.linear_model import Lasso
%matplotlib inline
```

Load data

In [43]:
```
train_file = 'data/problem3data.txt'
train_data = genfromtxt(train_file, delimiter='\t')

y_train = train_data[:, 9]
x_train = train_data[:, :9]

def lasso(a, x, y):
    # run lasso and return weights
    clf = Lasso(alpha=a)
    clf.fit(x, y)
    return clf.coef_

def ridge(a, x, y):
    # run ridge and return weights
    clf = linear_model.Ridge(alpha=a)
    clf.fit(x, y)
    return clf.coef_

c = []
c1 = []
c2 = []
c3 = []
c4 = []
c5 = []
c6 = []
c7 = []
c8 = []
c9 = []

alphas = np.linspace(.01, 3, 30)

for alpha in alphas:
    c.append(lasso(alpha, x_train, y_train))

for i in c:
    c1.append(i[0])
    c2.append(i[1])
    c3.append(i[2])
    c4.append(i[3])
    c5.append(i[4])
    c6.append(i[5])
    c7.append(i[6])
    c8.append(i[7])
    c9.append(i[8])

x = alphas
fig = plt.figure()
plt.title('Lasso')
plt.plot(x, c1, x, c2, x, c3, x , c4, x, c5, x, c6, x, c7, x, c8, x, c9)

plt.legend(('w$_1$','w$_2$', 'w$_3$', 'w$_4$', 'w$_5$', 'w$_6$', 'w$_7$', 'w$_8$',
'w$_9$'))
plt.xlabel(r'$\alpha$')
plt.ylabel('Weights')
plt.margins(y=0.02)
```


Lasso
Weights
α
w1
w2
w3
w4
w5
w6
w7
w8
w9
4
3
2
1
0
−1
−2
−3
−4
0.0
0.5
1.0
1.5
2.0
2.5
3.0

In [63]:
```
train_file = 'data/problem3data.txt'
train_data = genfromtxt(train_file, delimiter='\t')

y_train = train_data[:, 9]
x_train = train_data[:, :9]

c = []
c1 = []
c2 = []
c3 = []
c4 = []
c5 = []
c6 = []
c7 = []
c8 = []
c9 = []

alphas = []
alpha = 0.0
n = 0

while n < 6:
    c.append(ridge(alpha, x_train, y_train))
    alphas.append(alpha)
    alpha += 30

    for i in c[-1]:
        if math.fabs(i) < 0.3:
            n += 1

for i in c:
    c1.append(i[0])
    c2.append(i[1])
    c3.append(i[2])
    c4.append(i[3])
    c5.append(i[4])
    c6.append(i[5])
    c7.append(i[6])
    c8.append(i[7])
    c9.append(i[8])

x = alphas
fig = plt.figure()
plt.title('Ridge')
plt.plot(x, c1, x, c2, x, c3, x , c4, x, c5, x, c6, x, c7, x, c8, x,c9)
plt.legend(('w$_1$','w$_2$', 'w$_3$', 'w$_4$', 'w$_5$', 'w$_6$', 'w$_7$', 'w$_8$',
'w$_9$'))
plt.xlabel(r'$\alpha$')
plt.ylabel('Weights')
plt.margins(y=0.02)
```


Ridge
Weights
α
w1
w2
w3
w4
w5
w6
w7
w8
w9
4
3
2
1
0
−1
−2
−3
−4
0
500
1000
1500
2000
2500

In [ ]: