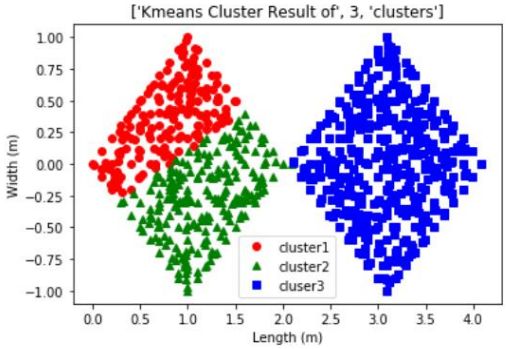
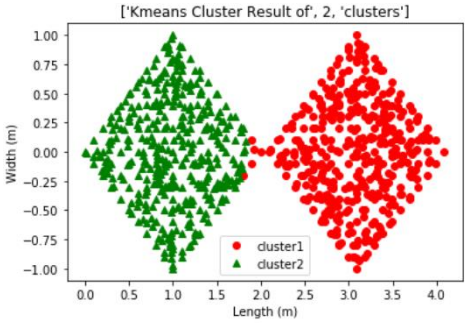
Assignment 3 Ruojun Li

Problem 1 output:

K-means with 3 clusters:



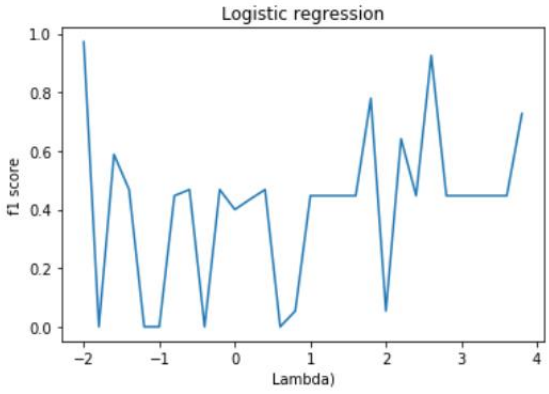
K-means with 2 clusters:

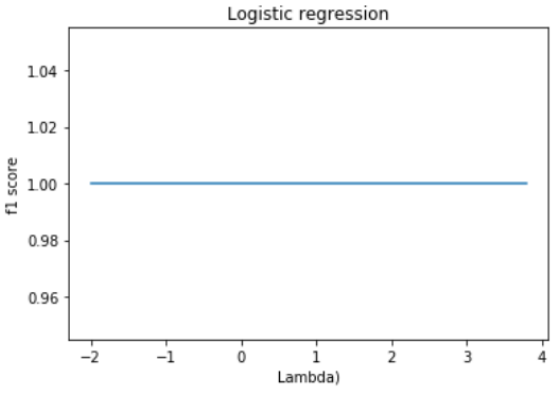


Problem2 output:

Left : Logistic regression's f-measure vs lambda. Final accuracy is 75%.

Right: Standardization Logistic regression's f-measure vs lambda. Final accuracy is 100%



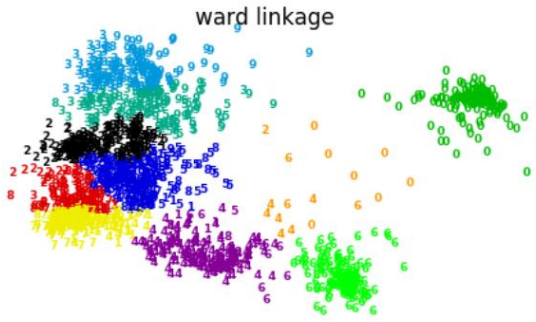


Problem3 output:

a.

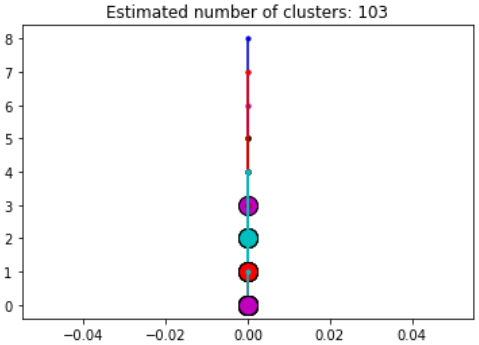
```
Confusion matrix is:
[[  7   1   0  15  11   0 144   0   0   0]
 [ 16  83  52   0  10   0   1   2  18   0]
 [  0   6 107   2  60   2   0   0   0   0]
 [  2   0  72  19  86   2   0   2   0   0]
 [ 37  86   0   0   0   2   9   7  40   0]
 [ 77   0   0   2   5  41   1  56   0   0]
 [  4   4   8   0 113   0  52   0   0   0]
 [  0  32   2 123   0   3   2  11   6   0]
 [  4  42  18   6  85   4   5  10   0   0]
 [ 44   0   0  12  99   2   1  12  10   0]]
Empty clusters are:
[10] =-1
Accuray 5.620558094529484
```

b.




```
Confusion matrix is:
[[  0   0   0   0   0 171   0   0   7   0]
 [  4   4  70   0   0   0   0  87   0  17]
 [130   0  29   0   3   0   0   0   1  14]
 [ 19   0   7  92  56   0   0   0   0   9]
 [  0 166   1   0   0   0   0   7   6   1]
 [ 27   2 104   8  40   0   1   0   0   0]
 [  0  11   0   0   0   0 167   0   3   0]
 [  0   0  15   0   0   0   0 136   0  28]
 [ 39   2  60   2   4   0   0   9   0  58]
 [  3   0  27  85  57   0   0   4   0   4]]
Accuray nan
```

c.



Problem 4 output:

a.

```
prediction: [1. 0. 0. 1. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0. 0. 1. 0. 0.
 0. 1. 0. 1. 0. 0. 0. 0.]
true label: [1. 0. 0. 1. 0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 1. 0. 0. 0. 0. 0. 1. 0. 0.
 0. 1. 0. 1. 0. 0. 0. 0.]
f-measure: 0.9803921568627451
```

b.

```
prediction: [0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.
 0. 0. 0. 0. 0. 0. 0. 0.]
true label: [1. 0. 0. 1. 0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 1. 0. 0. 0. 0. 0. 1. 0. 0.
 0. 1. 0. 1. 0. 0. 0. 0.]
f-measure: 0.8771929824561403
```

c.

```
prediction: [1. 0. 0. 1. 0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 1. 0. 0. 0. 0. 0. 1. 0. 0.
 0. 1. 0. 1. 0. 0. 0. 0.]
true label: [1. 0. 0. 1. 0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 1. 0. 0. 0. 0. 0. 1. 0. 0.
 0. 1. 0. 1. 0. 0. 0. 0.]
Test f-measure: 1.0
Test f-measure: 1.0
```