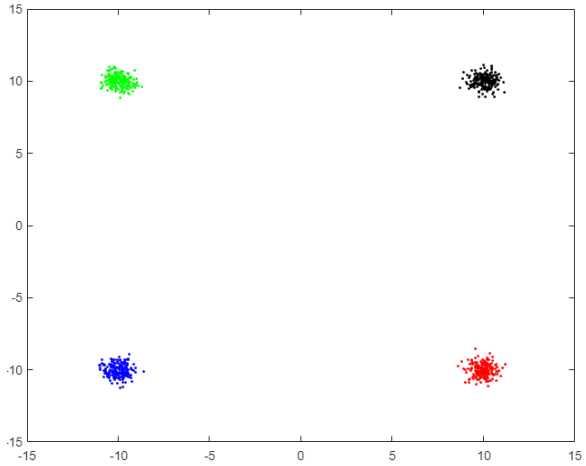
程式作業 3 109062639 葉哲欣

1.

(a.)

```
m1_a = [-10;-10];
m2_a = [-10;10];
m3_a = [10;-10];
m4_a = [10;10];
S = [0.2,0;0,0.2];
Scatter_w = [0.2191,-0.0039;-0.0039,0.2110]; Scatter_b = [100,0;0,100];
Scatte_m = [100.2191,-0.0040;-0.0040,100.2120]
```

J3 = 983.3032

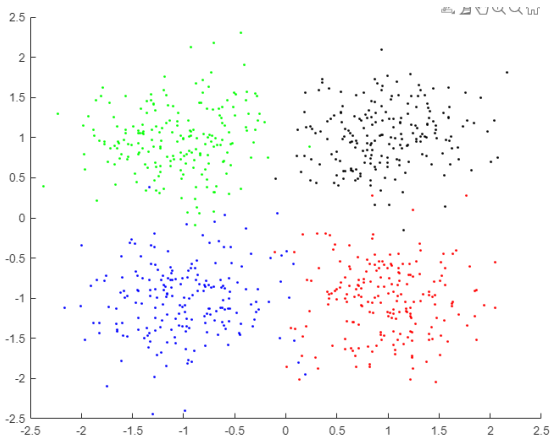


(b.)

```
m1_b = [-1;-1];
m2_b = [-1;1];
m3_b = [1;-1];
m4_b = [1;1];
S = [0.2,0;0,0.2];
Scatter_w = [0.1932,0.0059;0.0059,0.2252]; Scatter_b = [1,0;0,1];

Scatte_m = [1.1937,0.0059;0.0059,1.2252];
```

J3 = 13.0312



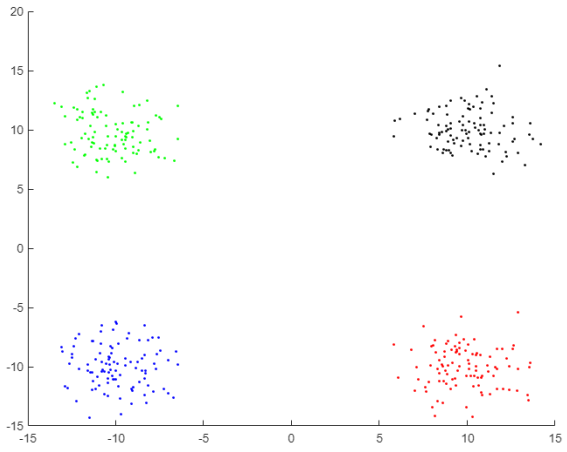
(c.)

```
m1_c = [-10;-10];
m2_c = [-10;10];
m3_c = [10;-10];
m4_c = [10;10];
Scatter_w = [0.2191,-0.0039;-0.0039,0.2210]; Scatter_b = [100,0;0,100];

Scatte_m = [102.5652,-0.0483;-0.0483,102.7643];
```

J3 = 72.0723

從上面三圖我們可以發現:class data 若彼此越相近，J3 值越小;相反，若彼此越遠，J3 值越大。



2.

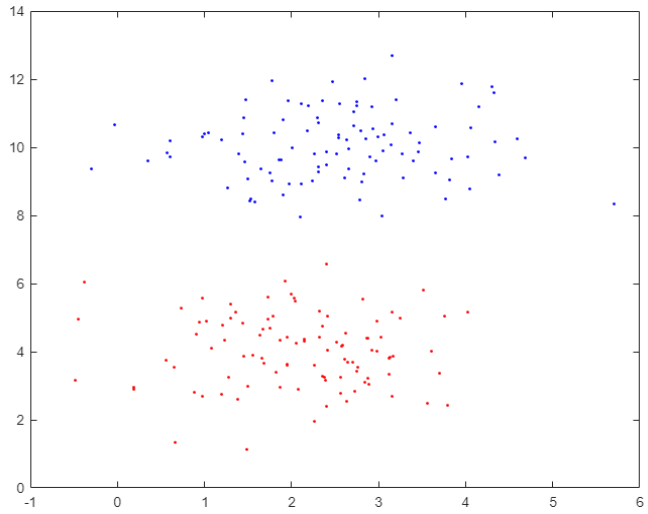
(a.)

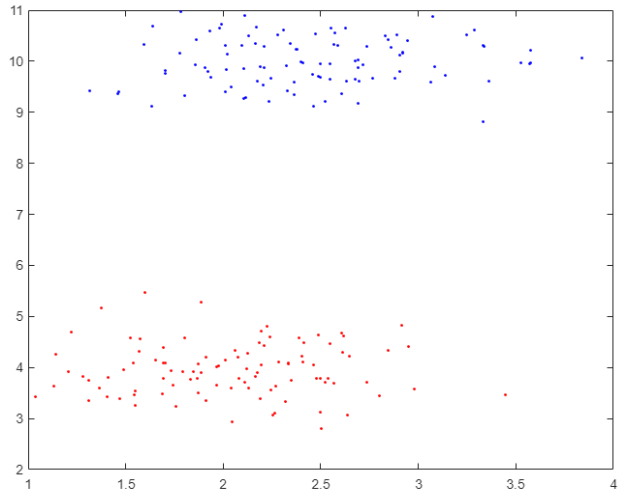
m:[2;4];

S:[1,0;0,1];
FDR ratio:[0.1024;17.1126]

(b.)
m:[2;4];
S:[0.25,0;0,0.25];
FDR ratio:[0.3457;74.9411]

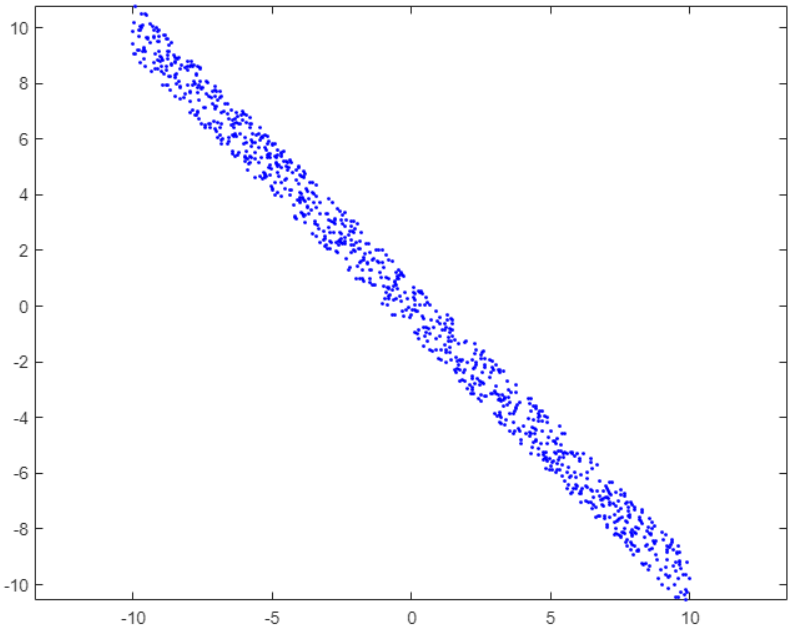
(c.)根據 FDR ratio 公式, 從上圖分布及 mean vector 固定。Variance 越小，FDR ratio 越大。根據 (a) (b.)FDR ratio 結果得證





3.
(a.)生成 data

generate_hyper



(b.)將生成 data 做 PCA，得出結果

Eigenvalue:[6.7912,0.170]

Eigenvector[-0.7039,-0.7103;0.7103,-0.7039]

Covariance matrix:[3.4722e+04,-3.4726 e+04;-3.4726 e+04,-3.5067 e+04]

(c.)從結果圖我們可以看到，data 透過 PCA 降維後，投影在 eigenvector 上(紅點)