Part1

1.

mean vector of class 1: [1.3559426 -1.34746216]

mean vector of class 2: [-1.29735587 1.29096203]

2.Within-class scatter matrix SW:

[[388.64001349 -228.92177708]

[-228.92177708 665.56910433]]

3 Between-class scatter matrix SB:

[[7.03999279 -7.00052687]

[-7.00052687 6.9612822]]

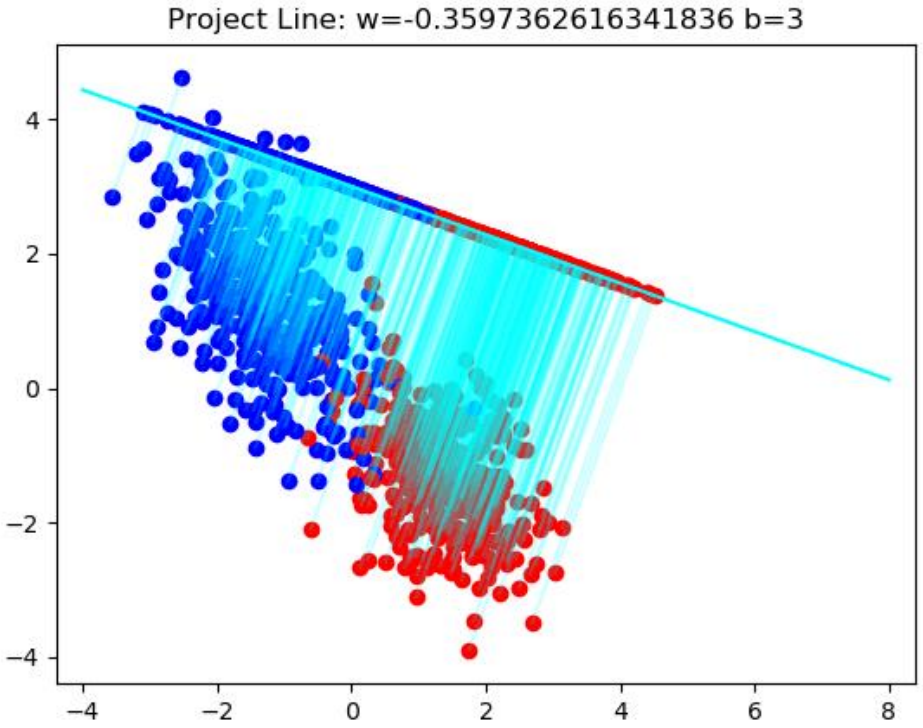
4.fisher's linear discriminant:

[[-0.00563343]

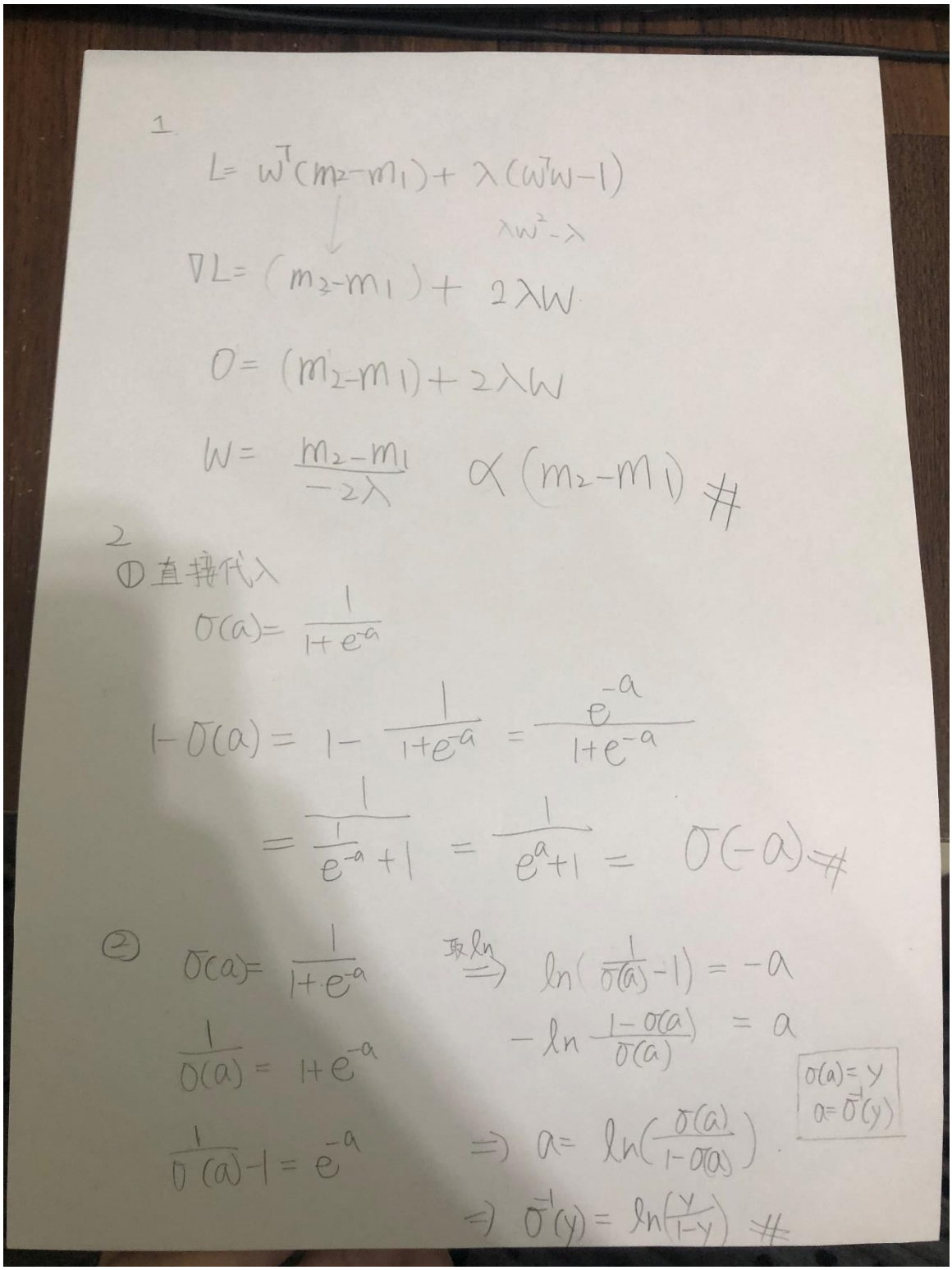
[0.00202655]]

5. Accuracy of test-set 0.916

6.



Part2



1.

$L = w^T(m_2 - m_1) + \lambda(w^T w - 1)$

$\lambda w^2 - \lambda$

$\nabla L = (m_2 - m_1) + 2\lambda w$

$0 = (m_2 - m_1) + 2\lambda w$

$w = \frac{m_2 - m_1}{-2\lambda} \propto (m_2 - m_1)$ #

2.

① 直接代入

$\sigma(a) = \frac{1}{1+e^{-a}}$

$1 - \sigma(a) = 1 - \frac{1}{1+e^{-a}} = \frac{e^{-a}}{1+e^{-a}}$

$= \frac{1}{\frac{1}{e^{-a}} + 1} = \frac{1}{e^a + 1} = \sigma(-a)$ #

② $\sigma(a) = \frac{1}{1+e^{-a}}$ 取ln $\Rightarrow \ln\left(\frac{1}{\sigma(a)} - 1\right) = -a$

$-\ln\frac{1-\sigma(a)}{\sigma(a)} = a$

$\frac{1}{\sigma(a)} = 1 + e^{-a}$

$\frac{1}{\sigma(a)} - 1 = e^{-a}$ $\Rightarrow a = \ln\left(\frac{\sigma(a)}{1-\sigma(a)}\right)$

$\sigma(a) = y$

$a = \sigma^{-1}(y)$

$\Rightarrow \sigma^{-1}(y) = \ln\left(\frac{y}{1-y}\right)$ #