Final Exam

1.
Euclidean distance between x and (0,0,...0)

$||x||_2 = \sqrt{(-2-0)^2 + (-2-0)^2 + \ldots + (-2-0)^2} = \sqrt{4d} = 2\sqrt{d}$

2.
(a)
0.7

(b)
0.75

3.
(a)
+

(b)
-

(c)
2/6=33.3%

4.
10000/4=2500

5.
(a)
regression

(b)
classification

(c)
regression

6.
(a)
$||x||_1 = 1 + 2 + 3 = 6$

(b)
$x^T x = 1 + 4 + 9 = 14$

(c)
$$xx^T = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 4 & 6 \\ 3 & 6 & 9 \end{pmatrix}$$

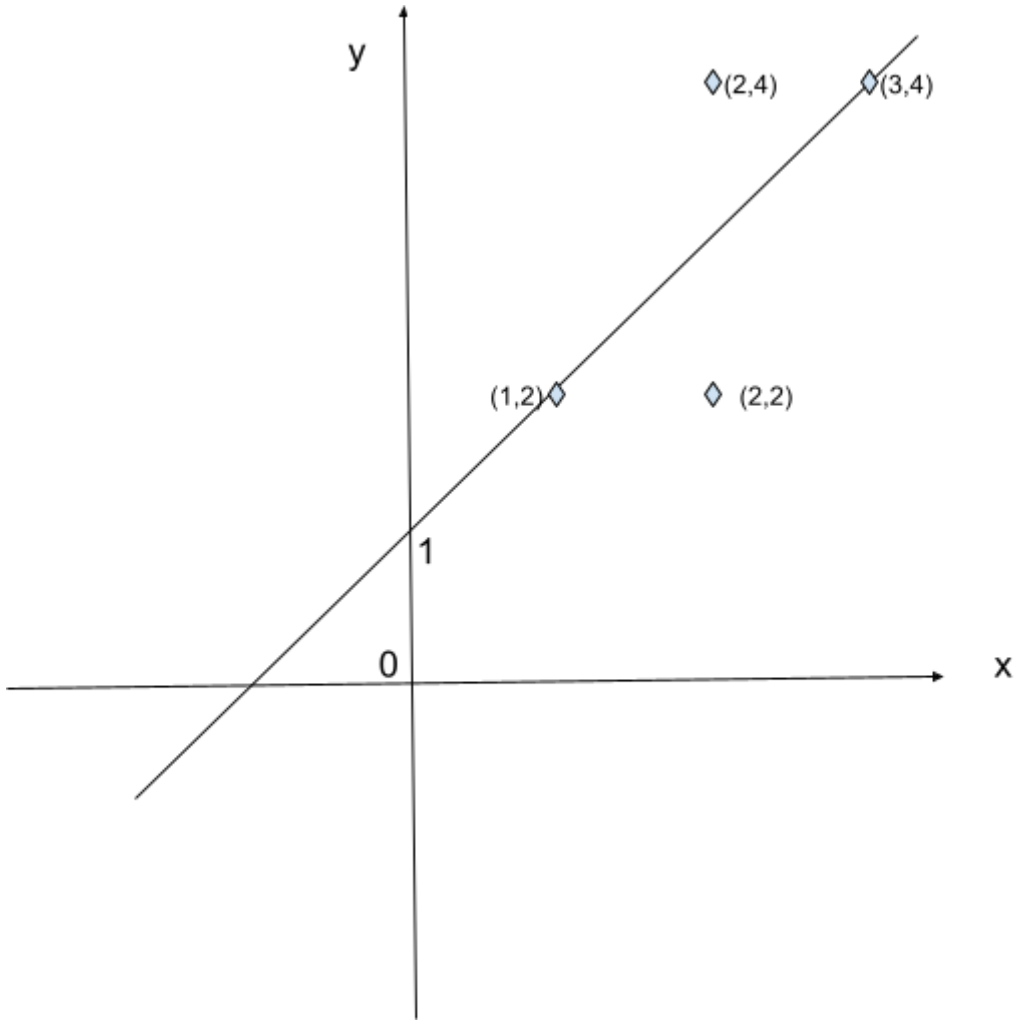
7.
(a)
Metric

(b)
Metric

(c)
Not a metric, violates triangle inequality.

8.
(a)
y=x+1

(b)

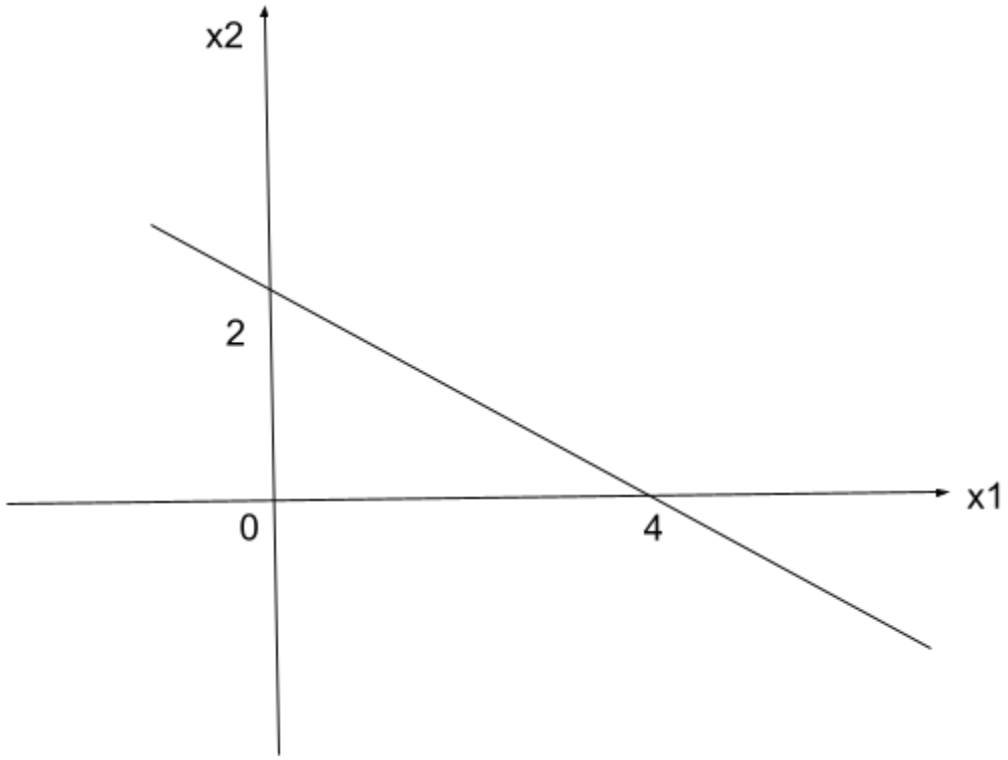


9.

(a)

$x_1 + 2x_2 - 4 = 0$ => $x_2 = 1/2(4 - x_1) = 2 - 0.5x_1$

$x_2 = -0.5x_1 + 2$



(b)

+1

(c)

$P_r(y = 1|x) = \frac{1}{1+e^{-(w \cdot x+b)}} = \frac{1}{1+e^{-(1\times3+2\times2-4)}} = \frac{1}{1+e^{-3}}$

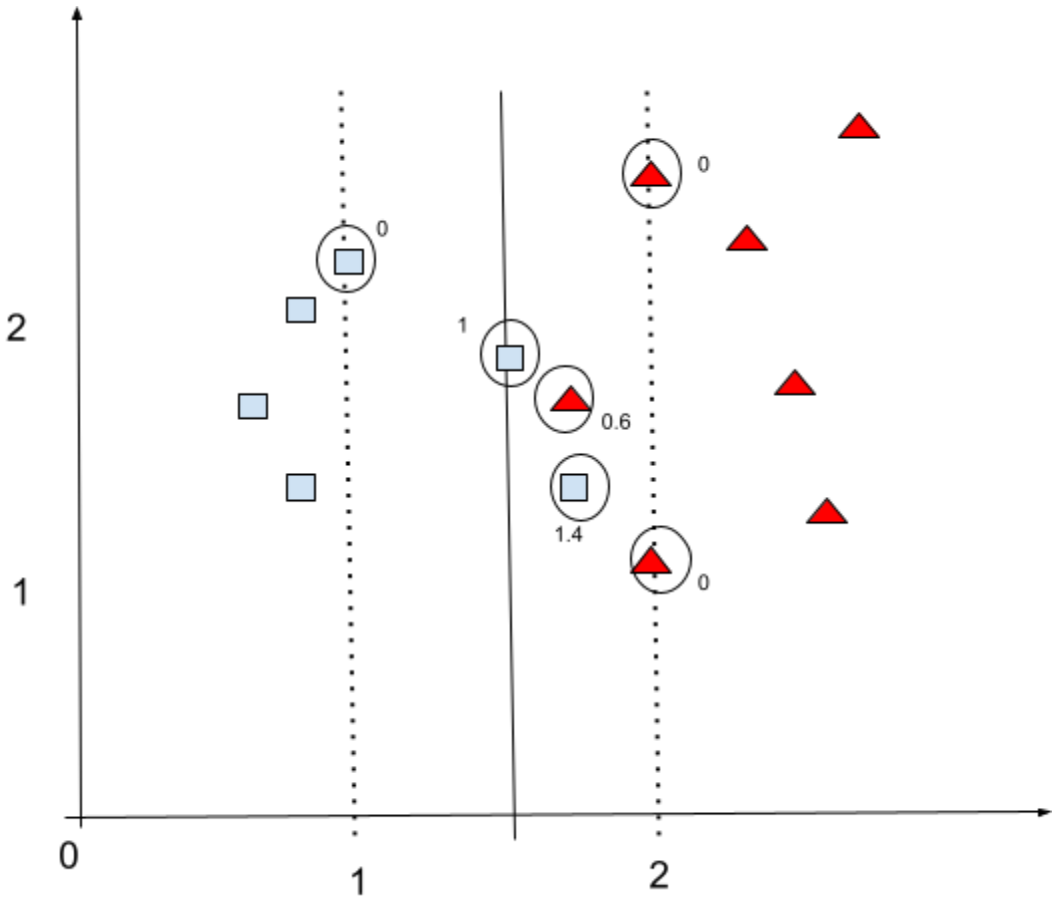
10.
(a)
Lasso

(b)
least-squares

11.
(a)
$$\begin{pmatrix} 2w_1 + 2w_3 \\ -w_3 \\ 10w_3 + 2w_1 - w_2 \end{pmatrix}$$

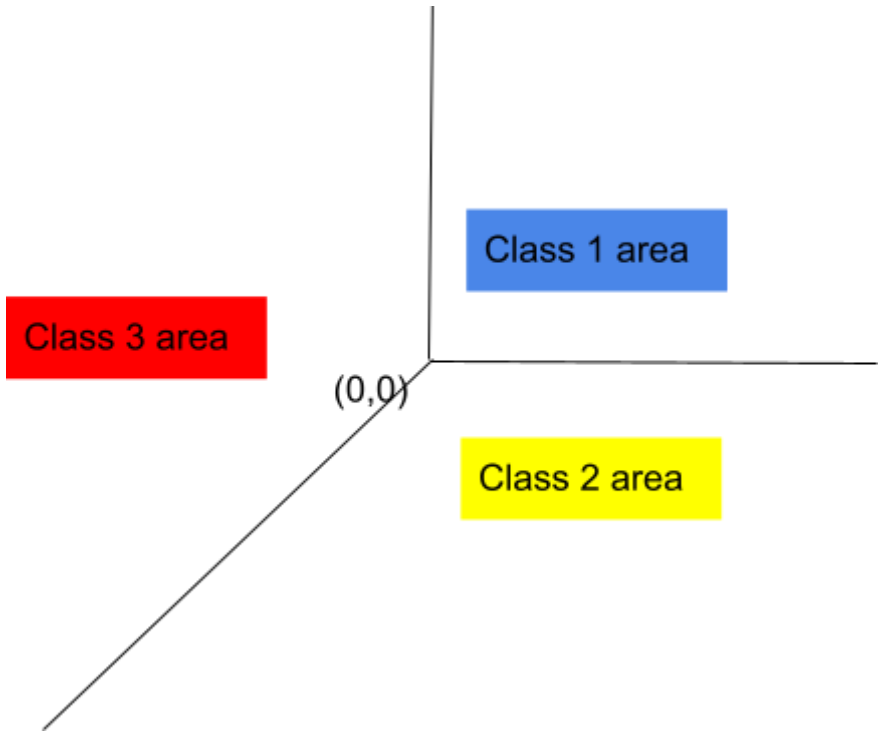
(b)
$$\begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} - 0.1 \begin{pmatrix} 4 \\ -1 \\ 11 \end{pmatrix} = \begin{pmatrix} 0.6 \\ 1.1 \\ -0.1 \end{pmatrix}$$

12.
(a)

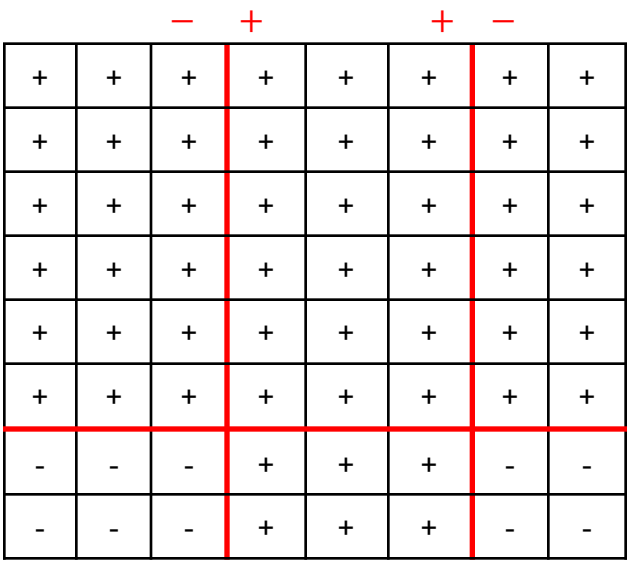


(b)
2

13.



14.



15.
(a)
(0, 0, 1)

(b)
M= $\begin{pmatrix} 3/5 & -4/5 & 0 \\ 4/5 & 3/5 & 0 \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} 4 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} 3/5 & 4/5 & 0 \\ -4/5 & 3/5 & 0 \\ 0 & 0 & 1 \end{pmatrix}$

(c)
(10, -5)

(d)
(10,5,0)