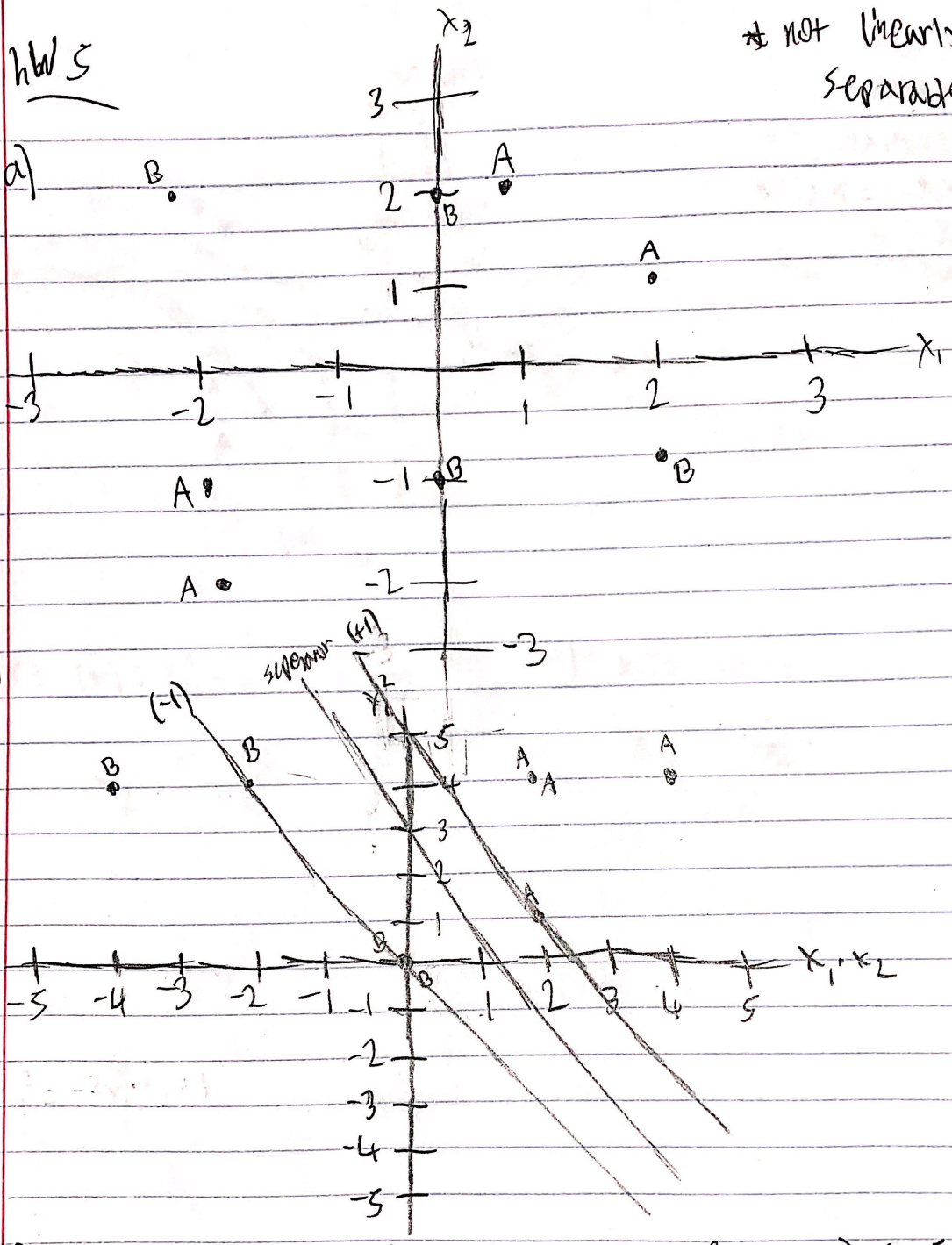
hw 5

* not linearly separable

a)



x_1	x_2	class
-2	-2	A
-2	-1	A
1	2	A
2	1	A
-2	2	B
0	2	B
0	-1	B
2	-1	B

b)

x_1^2	$x_1 \cdot x_2$	class
4	4	A
4	2	A
1	2	A
4	2	A
4	-4	B
0	0	B
0	0	B
4	-2	B

c) eq. of class boundary: $x_1^2 = -2(x_1 \cdot x_2) + 2.5$, $x_1^2 + 2(x_1 \cdot x_2) - 2.5 = 0$

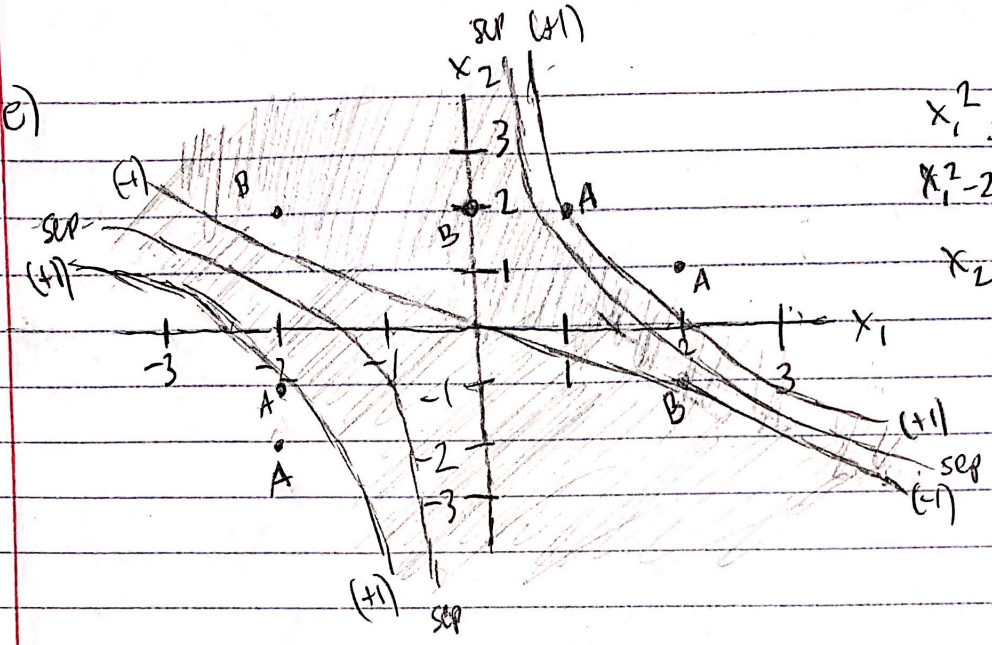
(-1): $x_1^2 = -2(x_1 \cdot x_2)$, $x_1^2 + 2(x_1 \cdot x_2) = 0$, $x_1^2 + 2(x_1 \cdot x_2) - 1 = -1$

(+1): $x_1^2 = -2(x_1 \cdot x_2) + 5$; $x_1^2 + 2(x_1 \cdot x_2) - 5 = 0$

d) support vectors: (-1): (4, -2), (0, 0), (0, 0) → (2, -1), (0, -1), (0, 2)

(+1): (1, 2) → (1, 2)

e)



$$x_1^2 = -2x_1x_2 + 2.5$$

$$x_1^2 - 2.5 = -2x_1x_2$$

$$x_2 = \frac{x_1^2 - 2.5}{-2x_1}$$

f) $(+1)$: $x_1^2 = -2(x_1 \cdot x_2) + 5$

$$x_2 = \frac{x_1^2 - 5}{-2x_1}$$

(-1): $x_1^2 = -2x_1x_2$

$$x_2 = -\frac{x_1}{2}$$