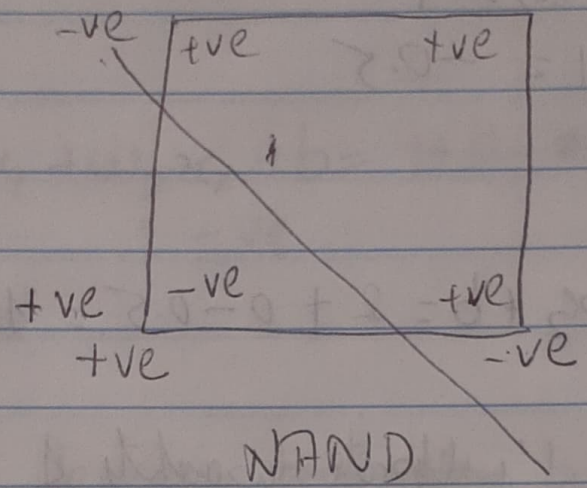
Problem 1

1.) For NAND function, the -ve & the +ve classes are linearly separable.



NAND

We can see from above that it is linearly separable.

2.) Decision Boundary = $x_1 + x_2 - \frac{1}{2} = 0$

$\therefore w_1 = 1, w_2 = 1, b = -0.5$

$P_1(0, 1)$

$\therefore w_1 x_1 + w_2 x_2 + b = 0 + 1 + 0 - 0.5 = 0.5$

+ve

$\therefore$ fail $\therefore$ Update weights & bias

$\therefore w_1 = w_1 - x_1 = 1$

$w_2 = w_2 - x_2 = 0$

$b = b - 1 = -1.5$

$P_2(1, 1)$

$\therefore w_1x_1 + w_2x_2 + b = 1 + 0 - 1.5 = -0.5$

$\therefore$ -ve

$\therefore$ fail $\therefore$ Update weights & bias

$w_1 = w_1 + x_1 = 2$

$w_2 = w_2 + x_2 = 1$

$b = b + 1 = -0.5$

$P_3(1, 0)$

$w_1x_1 + w_2x_2 + b = 2 + 0 - 0.5 = 1.5$

$\therefore$ +ve

$\therefore$ ~~Pass~~ fail $\therefore$ Upate weights & bias

$w_1 = w_1 - x_1 = 1$

$w_2 = w_2 - x_2 = 1$

$b = b - 1 = -1.5$

$P_4(0, 0)$

$w_1x_1 + w_2x_2 + b = 0 + 0 - 1.5 = -1.5$

$\therefore$ -ve

$\therefore$ Pass

$P_1(0, 1)$

$w_1x_1 + w_2x_2 + b = 0 + 1 - 1.5 = -0.5$

$\therefore$ -ve

$\therefore$ Pass

$P_2(1,1)$

$$w_1 x_1 + w_2 x_2 + b = 1 + 1 - 1.5 = 0.5$$

$\therefore$ +ve

$\therefore$ Pass

$P_3(1,0)$

$$w_1 x_1 + w_2 x_2 + b = 1 + 0 - 1.5 = -0.5$$

$\therefore$ -ve

$\therefore$ Pass

$\therefore$ Final decision ~~boundary~~ boundary

$$w_1 x_1 + w_2 x_2 + b = 0$$

$$x_1 + x_2 - 1.5 = 0$$