(a) In this case $x(t)$ must be an error value this means

$$\text{sign}(w^T(t)\,x(t)) \neq y(t)$$

sign as an activation function:

if $x < 0$ return -1

if $x = 0$ return 0 (No zero in this case)

if $x > 0$ return 1

This means if $y(t) = 1$,

$$w^T(t)\,x(t) < 0$$

$$y(t)\,w^T(t)\,x(t) < 0$$

If $y(t) = -1$, $x(t)\,W^T(t) > 0$

$$y(t)\,w^T(t)\,x(t) < 0$$

(b) If the data's linearly separable There will be no error, this means

if $y(t)=1$, $w^T(t)x(t)>0$

$$w^T(t)x(t) * y(t) > 0$$

if $y(t)=-1$, $w^T x(t) < 0$

$$w^T(t)x(t) * y(t) > 0$$

(c) First of all, in terms of $w(t+1)$, it means it must based on some error value that not correct yet.

$$y(t)w^T(t+1)x(t)$$

$$= y(t)\left(w(t)+y(t)x(t)\right)^T x_t$$

As for $w(t)+y(t)x(t)$

Because they can do addition, they $w(t)$ and $y(t)x(t)$ must have same

~~to~~ columns and rows so can be writeas

$$W^T(t) + y^T(t)\, z^T(t)$$

Also see additional information for further explination!

So we can write

$$y(t)\left(W^T(t) + y^T(t)\, z^T(t)\right) \cdot z(t)$$

$$= y(t)\, x(t) \cdot W^T(t) + y^T(t)\, y(t)\, z^T(t)\, z(t)$$

Based on further information

$$z(t)\, y(t) = \begin{bmatrix} \text{Updater0} \\ \text{Updater1} \\ \text{Updater2} \end{bmatrix}$$

So $z^T(t)\, y^T(t) = [Up0, Up1, Up2]$

$x^T(t)\, x(t)\quad y^T(t)\, y(t)$

$= V_{p0}^2 + V_{p1}^2 + V_{p2}^2$

Updater(whatever)'s square must be a postive number.

So $V_{p1}^2 + V_{p2}^2 + V_{p0}^2 > 0$, $x^T(t)\, y(t)$

$x(t)\, y^T(t)$

> 0

So $y(t)\, W^T(1+t)\, x(t)$

$= y(t)\, x(t)\, W^T(t) +$ a postive num

$> y(t)\, x(t)\, W^T(t)$

No.
Date

Sk2 : $W^T x$

$$= [W_0, W_1, W_2] \times \begin{bmatrix} 1 \\ x_1 \\ x_2 \end{bmatrix}$$

$$= W_0 + W_1 x_1 + W_2 x_2 = 0$$

$$W_2 x_2 = (W_0 + W_1 x_1) \times -1$$

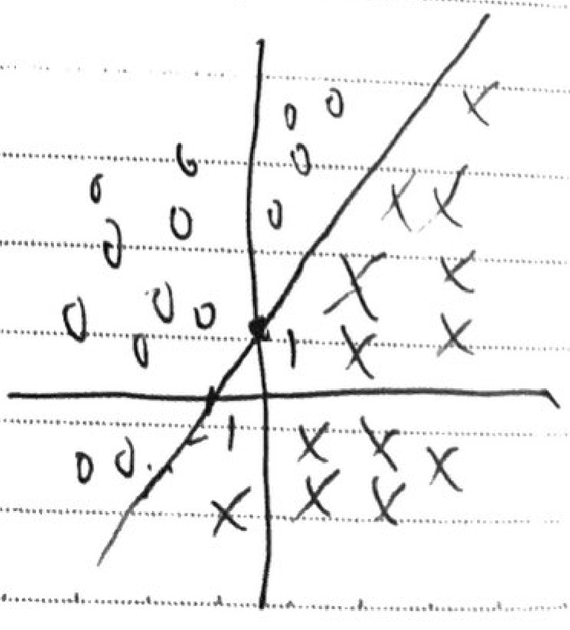
$$x_2 = -\frac{W_1}{W_2} x_1 - \frac{W_0}{W_2}$$

$$m = -\frac{W_1}{W_2} \qquad c = -\frac{W_0}{W_2}$$

(2)

(a) $W_0 = 1 \quad W_1 = 1 \quad W_2 = -1$

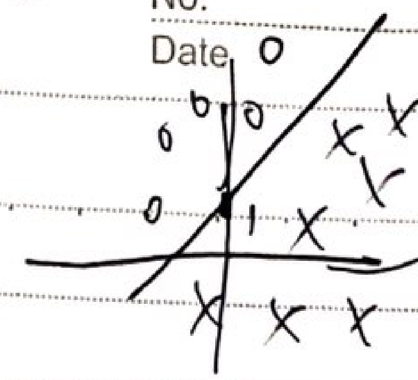
$m = 1 \quad c = 1$



$\cdot D(23 + 2.73.15)$

(b) $w_0 = -1 \quad w_1 = -1 \quad w_2 = 1$

$m = +1 \quad c = +1$



$$\begin{bmatrix} 1 & x_{11} & x_{12} \\ 1 & x_{21} & x_{22} \\ 1 & x_{31} & x_{32} \\ 1 & x_{41} & x_{42} \\ 1 & \vdots & \\ 1 & x_{n1} & x_{n2} \end{bmatrix} \begin{bmatrix} w_0 \\ w_1 \\ w_2 \end{bmatrix} = \begin{bmatrix} y_1 \\ y_2 \\ y_3 \\ \vdots \\ y_n \end{bmatrix}$$

$$y(t)\,x_i(t) = \begin{bmatrix} y_1 + y_2 + y_3 + y_4 + \cdots y_n \\ x_{11}y_1 + x_{21}y_2 + x_{31}y_3 + \cdots x_{n1}y_n \\ x_{12}y_1 + x_{22}y_2 + x_{32}y_3 + \cdots x_{n2}y_n \end{bmatrix}$$

$$= \begin{bmatrix} \text{Updater0} \\ \text{Updater1} \\ \text{Updater2} \end{bmatrix} \times \cancel{\text{learning rate}}$$

Additional Information

$$w(t+1) = \begin{bmatrix} w_0 + \text{Update}0 \\ w_1 + \text{Update}1 \\ w_2 + \text{Update}2 \end{bmatrix} \to 21A$$

× learning rate

$$W^T(t+1) = [w_0 + Up_0,\ w_1 + Up_1,\ w_2 + Up_2]$$

$$= W^T(t) + (y(t)\ z(t))^T$$

$$= [w_0, w_1, w_2] + [Up_0, Up_1, Up_2)$$