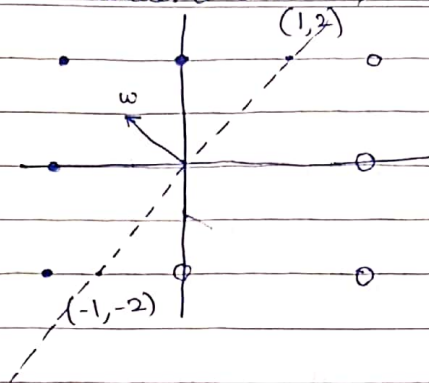


(w indicates its direction not its magnitude)

DATE

2 a)



eqn of line given 2 pts

$$\frac{y - y_1}{y_2 - y_1} = \frac{x - x_1}{x_2 - x_1}$$

$$\frac{y - 2}{-2 - 2} = \frac{x - 1}{-1 - 1}$$

$$\frac{y - 2}{-4} = \frac{x - 1}{-2}$$

$$\frac{y - 2}{-4} = \frac{x - 1}{-2} \Rightarrow y - 2 = 2(x - 1) \Rightarrow y - 2 = 2x - 2 \Rightarrow y = 2x$$

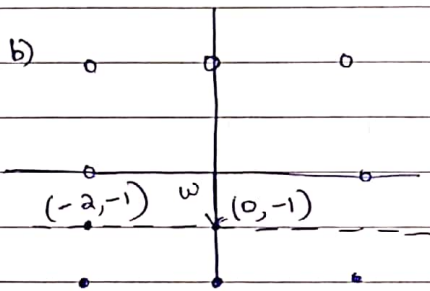
$$\boxed{y = 2x}$$

This is of the form $y = mx + b$. Need it in the form of

$$w^T x + b = 0 \Rightarrow w_1 x_1 + w_2 x_2 + b = 0 \quad \text{Here } m = -\frac{w_1}{w_2} \Rightarrow 2 = -\frac{w_1}{w_2}$$

$$\Rightarrow \boxed{W = \begin{bmatrix} w_1 \\ w_2 \end{bmatrix} = \begin{bmatrix} -2 \\ 1 \end{bmatrix}} \\ B = 0$$

b)



eqn of line given 2 pts

$$\frac{y - y_1}{y_2 - y_1} = \frac{x - x_1}{x_2 - x_1}$$

$$\frac{y + 1}{-1 + 1} = \frac{x - 0}{-2 - 0}$$

$$\frac{y + 1}{0} = \frac{x}{-2} \Rightarrow y + 1 = 0 \Rightarrow y = -1$$

\Rightarrow eqn of line $\rightarrow y = -1$

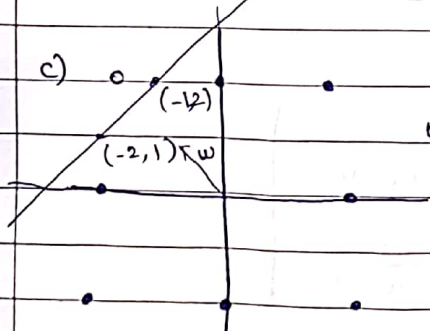
$$\Rightarrow m = 0 \Rightarrow w_1 = 0 \text{ and } w_2 = -1 \text{ (any positive or negative number)}$$

$$\boxed{W = \begin{bmatrix} 0 \\ -1 \end{bmatrix}} \\ \text{and } B = -1$$

Bias $b = -W^T x$

$$= - \begin{bmatrix} 0 & -1 \end{bmatrix} \begin{bmatrix} 0 \\ -1 \end{bmatrix} = -1$$

c)



eqn of line given 2 pts

$$w^T x + b = 0$$

$$\frac{y - y_1}{y_2 - y_1} = \frac{x - x_1}{x_2 - x_1}$$

$$\frac{y - 2}{1 - 2} = \frac{x + 1}{-2 + 1}$$

$$\Rightarrow \frac{y - 2}{-1} = \frac{x + 1}{-1} \Rightarrow y - 2 = x + 1 \Rightarrow y = x + 3$$

$$\frac{y - 2}{-1} = \frac{x + 1}{-1} \Rightarrow y = x + 3 \quad m = 1$$

$\Rightarrow w_1, w_2$ are ~~the~~ ∞

$$\boxed{W = \begin{bmatrix} -3 \\ 3 \end{bmatrix}} \\ B = -9$$

and $B = -W^T x$

$$= - \begin{bmatrix} -3 & 3 \end{bmatrix} \begin{bmatrix} -1 \\ 2 \end{bmatrix} = - \begin{bmatrix} 3 + 6 \end{bmatrix} = -9$$