Homework-1

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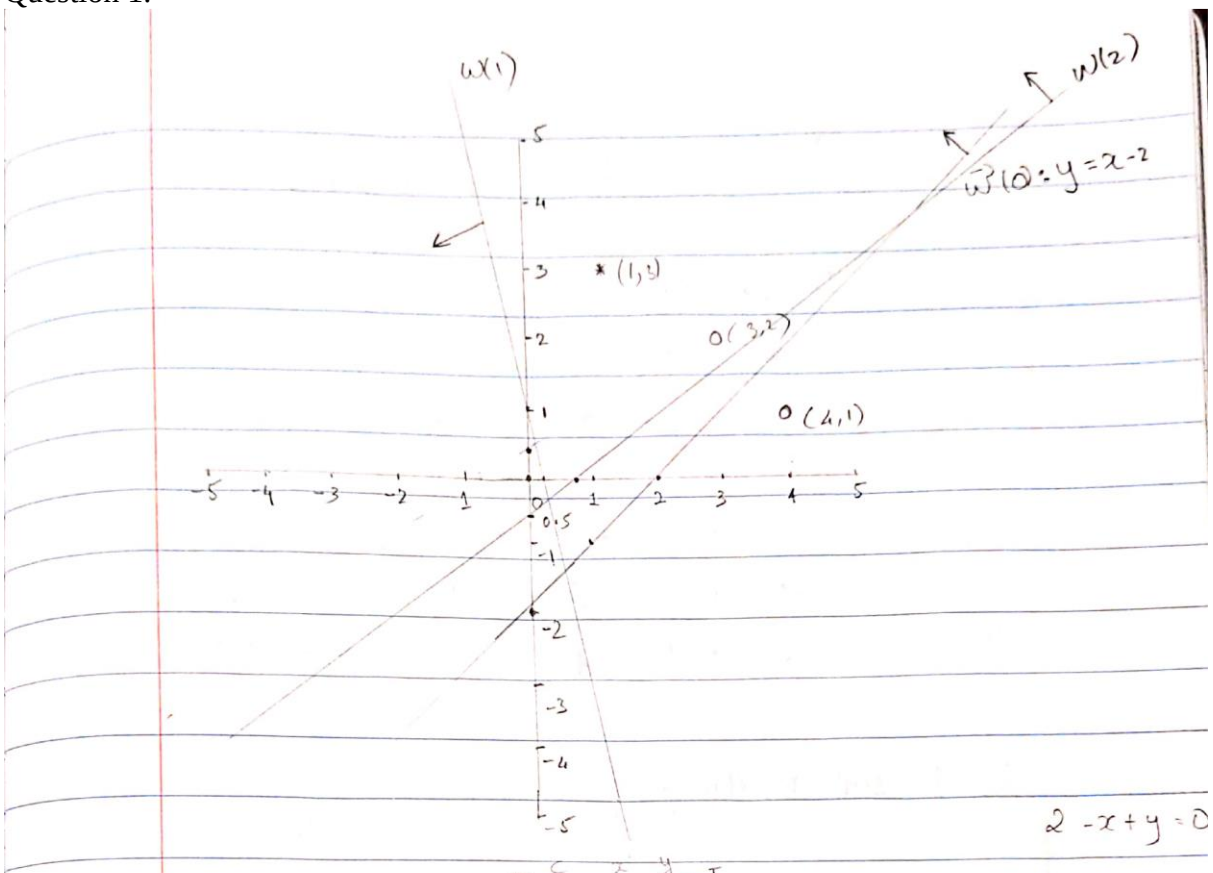
Question 1.



- Init vector $w(0) = [+2, -1, 1]^T$: $y = x - 2$

$\vec{w}(0)^T \vec{x}_1 = (2 \times 1) + (-1 \times 1) + (1 \times 3) = 4 > 0$.

$\vec{w}(0)^T \vec{x}_2 = (2 \times 1) + (3 \times -1) + (4 \times 1) = 3 > 0$. X (Incorrectly classified)

$\vec{w}(0)^T \vec{x}_3 = (2 \times 1) + (4 \times -1) + (1 \times +1) = -1 < 0$

$\vec{w}(1) = \vec{w}(0) - \vec{x}_2 = [2, -1, 1]^T - [1, 3, 2]^T = [1, -4, -1]$

$\vec{w}(1) = [1, -4, -1]$

$1 - 4x - y = 0$;

$\vec{w}(1)^T (\vec{x}_1) = (1 \times 1) + (-4 \times 1) + (-1 \times 3) = -6 < 0$ X (Incorrectly classified)

$\vec{w}(1)^T (x_2) = (1 \times 1) + (-4 \times 3) + (-1 \times 2) = -13 < 0$

$\vec{w}(1)^T (x_3) = (1 \times 1) + (-4 \times 4) + (-1 \times 1) = -16 < 0$

$w(2) = \vec{w}(1) + \vec{x}_1 = [1, -4, 1] + [1, 1, 3] = [2, -3, 4]$

$2 - 3x + 4y = 0$

$4y = 3x - 2$

$y = \frac{3}{4}x - 0.5 = 0.75x - 0.5$

$\vec{w}(2)^T \vec{x}_1 = (2 \times 1) + (-3 \times 1) + (4 \times 3) = 11 > 0$ ✓

$w(2)^T \vec{x}_2 = (2 \times 1) + (-3 \times 3) + (4 \times 2) = 1 > 0$

$w(2)^T \vec{x}_3 = (2 \times 1) + (-3 \times 4) + (4 \times 1) = -6 < 0$ ✓

X_2 is still misclassified.