Problem 4:
Augment samples by adding an extra feature equal to 1. Replace all items from w2 to negative values.

ω2 -1 -1 -1 1 0 -2
ω1 1 0 0 1 2 0
ω2 -1 1 1 -1 -1 0
ω1 1 4 0 1 2 1
ω1 1 -1 1 1 1 0
ω1 1 -1 -1 -1 1 0
ω2 -1 1 -1 -1 -2 -1

Initial vector weight = [3 1 1 − 1 2 − 7]

Start checking each row:

1: [3 1 1 − 1 2 − 7] ^t * [-1 -1 -1 1 0 -2] = -3 -1 -1 -1 + 0 + 14 = 8 > 0 so not misclassified. Keep the weight the same.
2: [3 1 1 − 1 2 − 7] ^t * [1 0 0 1 2 0] = 3 + 0 + 0 -1 + 4 + 0 = 6 > 0 so not misclassified. Keep the weight the same.
3: [3 1 1 − 1 2 − 7] ^t * [-1 1 1 -1 -1 0] = -3 + 1 +1 +1 -2 + 0 = -2 < 0 so misclassified. Need to modify the weight. New weight W = [3 1 1 − 1 2 − 7] + [-1 1 1 -1 -1 0] = [2 2 2 -2 1 -7]
4: [2 2 2 -2 1 -7]^t * [1 4 0 1 2 1] = 2 + 8 + 0 -2 + 2 -7 = 3 > 0 so not misclassified.
5: [2 2 2 -2 1 -7]^t * [1 -1 1 1 1 0] = 2 + -2 +2 -2 +1 = 1 > 0 so not misclassified.
6: [2 2 2 -2 1 -7]^t * [1 -1 -1 -1 1 0] = 2 + -2 +2 + 2 +1 = 5 > 0 so not misclassified.
7: [2 2 2 -2 1 -7]^t * [-1 1 -1 -1 -2 -1] = -2 + 2 -2 +2 -2 +7 = 5 > 0 so not misclassified.

[2 2 2 -2 1 -7]
g(y) = 2y0 + 2y1 + 2y2 - 2y3 + 1y4 - 7y5

Solution vector:
g(x) = 2x(1) + 2x(2) - 2x(3) + 1x(4) - 7x(5) > -2 ---> w1
g(x) = 2x(1) + 2x(2) - 2x(3) + 1x(4) - 7x(5) < -2 ---> w2