Q2:

d1 = {X:(0, 1), p(Y = 0|X) = 0.3}
d2 = {X:(1, 0), p(Y = 0|X) = 0.7}
d3 = {X:(0, 0), p(Y = 0|X) = 0.5}

$$p(\hat{y} = 0|x) = \frac{1}{1+\exp(w^T x + b)} = \frac{1}{1+\exp(w_1 x_1 + w_2 x_2 + b)}$$

d3: $p(\hat{y} = 0|x) = \frac{1}{1+\exp(w_1 x_1 + w_2 x_2 + b)} = \frac{1}{1+\exp(w_1 * 0 + w_2 * 0 + b)} = 0.7 \rightarrow \exp(b) = 1 \rightarrow$ **b = 0**

d1: $p(\hat{y} = 0|x) = \frac{1}{1+\exp(w_1 x_1 + w_2 x_2 + b)} = \frac{1}{1+\exp(w_1 * 0 + w_2 * 1)} = 0.3 \rightarrow \exp(w_2 * 1) = 7/3 \rightarrow$ **w$_2$ = ln(7/3)**

d2: $p(\hat{y} = 0|x) = \frac{1}{1+\exp(w_1 x_1 + w_2 x_2 + b)} = \frac{1}{1+\exp(w_1 * 1 + w_2 * 0)} = 0.7 \rightarrow \exp(w_1 * 1) = 3/7 \rightarrow$ **w$_1$ = ln(3/7)**

d $_{Test}$: $p(\hat{y} = 0|x) = \frac{1}{1+exp(w_1 x_1 + w_2 x_2 + b)} = \frac{1}{1+exp(\ln(3/7) * -1 + \ln(7/3) * 0)} = \frac{1}{1+7/3} = 0.3$ < Th=0.5

→ Prediction is class 1!