SGD for Logistic Regression *(work with your random partner during lab)*

Say we have $p = 1$ and two training examples: $(x_1, y_1) = (3, 0)$ and $(x_2, y_2) = (7, 1)$, and we would like to fit a logistic model to this dataset.

1. Draw these two examples on a coordinate system and sketch a logistic function that would fit them (roughly). What is the optimal decision boundary? Does this help us uniquely determine $\hat{w}_0$ and $\hat{w}_1$?

2. Say in our SGD method, we choose to analyze (x_2, y_2) first. Before starting SGD, we set $w_0 = 0$ and $w_1 = 0$. After analyzing (x_2, y_2), what are w_0 and w_1? Choose $\alpha = 0.1$. Plot the decision boundary on your graph above.

3. Next we consider (x_1, y_1). What are w_0 and w_1 be after this second data point? Plot this decision boundary on your graph above. At this point we have finished *one* iteration of SGD.