

**Logistic Regression***(find and work with a partner)*

1. The output of logistic regression is a model that creates:

- (a) a linear decision boundary
- (b) a logistic decision boundary
- (c) no decision boundary

2. We use logistic regression for:

- (a) classification
- (b) regression
- (c) both

3. Our model in logistic regression is:

$$h_{\mathbf{w}}(\mathbf{x}) = p(y = 1|\mathbf{x}) = \frac{1}{1 + e^{-\mathbf{w} \cdot \mathbf{x}}}$$

If  $\mathbf{w}$  is the zero vector (as it would be when starting SGD), what is the probability  $y = 1$ ?

4. Say I train a binary logistic regression model (i.e. outcomes  $\in \{0, 1\}$ ) and end up with  $\hat{\mathbf{w}} = [\hat{w}_0, \hat{w}_1]^T = [-4, -5]^T$ . What is the decision boundary? Sketch a graph of this logistic model and label the decision boundary. How would you classify a new point  $x_{\text{test}} = -2$ ?

5. The graph below shows the cost for logistic regression as a function of the hypothesis  $h_{\mathbf{w}}(\mathbf{x})$ , for one example  $\mathbf{x}$ . Which curve corresponds to the true label  $y = 0$  and which corresponds to  $y = 1$ ?

