

## Homework 8 (Written Section)

1. For logistic regression with one predictor, we use the model:

$$\log \left( \frac{\theta(x)}{1 - \theta(x)} \right) = \beta_0 + \beta_1 x.$$

- (a) Show that solving for the probability of success for a given value of the predictor,  $\theta(x)$ , gives:

$$\theta(x) = \frac{\exp(\beta_0 + \beta_1 x)}{1 + \exp(\beta_0 + \beta_1 x)}$$

- (b) and:

$$\theta(x) = \frac{1}{1 + \exp(-\{\beta_0 + \beta_1 x\})}$$

2. Explain why we might be interested in transforming predictor variables for a logistic regression model.
3. On page 285 of the text, it states, "When  $X$  is a dummy variable, it can be shown that the log odds are also a linear function of  $x$ ." Suppose that  $X$  is a dummy variable, taking the value 1 with probability  $\pi_j, j = 0, 1$  conditional on  $Y = 0, 1$ .
- (a) Show that the log odds are a linear function of  $x$ .
- (b) Define the slope and intercept for the linear function.