1.

1. Using a little bit of algebra, prove that (4.2) is equivalent to (4.3). In other words, the logistic function representation and logit representation for the logistic regression model are equivalent.

- logistic function

$$p(X) = \frac{e^{\beta_0+\beta_1 X}}{1+e^{\beta_0+\beta_1 X}}. \qquad (4.2)$$

$$\frac{p(X)}{1-p(X)} = e^{\beta_0+\beta_1 X}. \qquad (4.3)$$

<pf>

$$1-p(X) = \frac{1}{1+e^{\beta_0+\beta_1 X}}$$

$$\Rightarrow \frac{p(X)}{1-p(X)} = \frac{\frac{e^{\beta_0+\beta_1 X}}{1+e^{\beta_0+\beta_1 X}}}{\frac{1}{1+e^{\beta_0+\beta_1 X}}}$$

$$= e^{\beta_0+\beta_1 X} \quad \#$$