VE572 Assignment 3

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Qurestion 1

(a)

$$Pr(Y = 1|X_1 = x_1|X_2 = x_2) = \frac{\exp(\beta_0 + \beta_1 x_1 + \beta_2 x_2)}{1 + \exp(\beta_0 + \beta_1 x_1 + \beta_2 x_2)}$$

$$Pr(Y = 1|X_1 = 40|X_2 = 3.5) = \frac{\exp(-6 + 0.05 \cdot 40 + 3.5)}{1 + \exp(-6 + 0.05 \cdot 40 + 3.5)} \approx 0.378$$

(b)

$$\frac{\exp(-6 + 0.05x_1 + 3.5)}{1 + \exp(-6 + 0.05x_1 + 3.5)} = 0.5$$

$$\exp(-6 + 0.05x_1 + 3.5) = 1$$

$$x_1 = 50$$

Question 2

(a)

$$odds(U.S.A|Y = 1) = \frac{513}{487}$$

$$odds(China|Y = 1) = \frac{116}{9}$$

(b)

$$OR = \frac{513/487}{928/72} = \frac{4617}{56492} \approx 8.173 \times 10^{-2}$$

(c)

$$\beta_0 = \ln \frac{116}{9} \approx 2.5819$$

$$\beta_0 + \beta_1 = \ln \frac{513}{487}$$

$$\beta_1 = \ln \frac{4617}{56492} \approx -2.5043$$

(d)

$$\beta_1 = \ln(OR)$$

(e)

$$\exp[\ln(OR) \pm 1.96 \times SE(\ln(OR))] = [0.0624, 0.1071]$$

Question 3

(a)

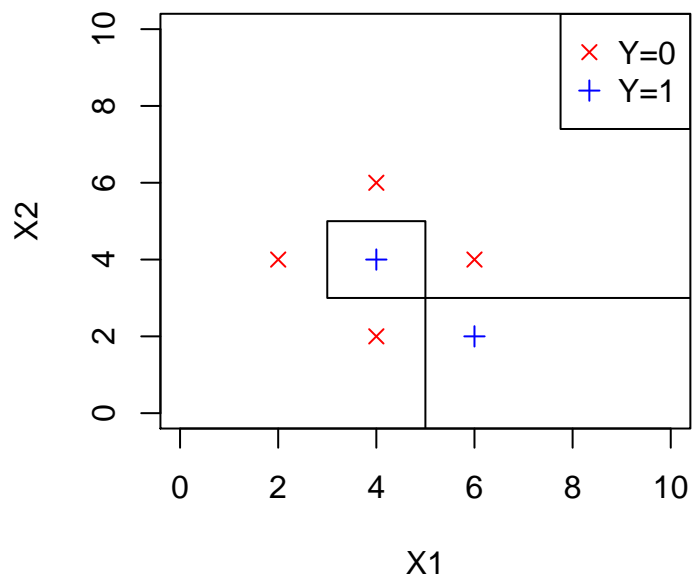$$\int_0^{0.05} 0.05 + x dx + \int_{0.05}^{0.95} 0.1 dx + \int_{0.95}^1 0.1 - x dx = 9.75\%$$

(b)

$$9.75\% \times 9.75\% = 0.950625\%$$

(c)

$$\sqrt[100]{0.1}$$

Question 4

(a)

(b)

$$Y(8,1) = 1$$

Question 5