HW 5

1. (12pt) Let π denote the probability that a randomly selected individual supports laws legalizing abortion predicted using gender ($G = 0$ if gender is male and $G = 1$ if gender is female), religion affiliation (protestant, catholic or jewish; $R_1 = 1$ if Protestant and 0 otherewise; $R_2 = 1$ if Catholic and 0 otherwise; $R_1 = R_2 = 0$ if Jewish) and political party (democrat, republican or independent ; $P_1 = 1$ if Democrat and 0 otherwise; $P_2 = 1$ if Republican and 0 otherwise; $P_1 = P_2 = 0$ if independent). The model used is

$$\text{logit}(\hat{\pi}) = \beta_0 + \beta_1 G + \beta_2 R_1 + \beta_3 R_2 + \beta_4 P_1 + \beta_5 P_2.$$

and the estimated logit model is

$$\text{logit}(\hat{\pi}) = 0.11 + 0.16G - 0.57R_1 - 0.66R_2 + 0.47P_1 - 1.67P_2.$$

   (a) (2pt) Estimate the probability that a male, protestant and republican supports laws legalizing abortion. Estimate the probability that female, catholic and democrat supports laws legalizing abortion

   (b) (2pt) Interpret $b_1 = 0.16$ and $b_2 = -0.57$.

   (c) (2pt) If $\text{SE}(b_1) = 0.064$ construct a 95% confidence interval for b_1 and interpret your result.

   (d) (2pt) Test $H_0 : \beta_1 = 0$ against $H_1 : \beta_1 \neq 0$

   (e) (2pt) If $\text{SE}(b_2) = 0.38$ construct a 95% confidence interval for b_2 and interpret your result.

   (f) (2pt) Test $H_0 : \beta_2 = 0$ against $H_1 : \beta_2 \neq 0$

2. (8pt) The data in the file adolescent.csv appeared in a national study of 15 and 16 year-old adolescents. The event of interest is ever having sexual intercourse. The goal is to study the effect if any of race and gender on having sexual intercourse (Yes, No). Consider the following model

$$\text{logit}(\pi(\text{Intercourse=Yes}|\text{Gender, Race})) = \beta_0 + \beta_1 \text{Gender} + \beta_2 \text{Race}$$

   (a) (4pt) Estimate β_1 and β_2 and interpret your result

   (b) (2pt) Construct a 95% confidence interval to describe the effect of gender on the odds of Intercourse controlling for race (i.e. construct a 95% interval for e^{β_1}), Interpret your result

   (c) (2pt) Test $H_0 : \beta_1 = 0$ against $H_a : \beta_1 \neq 0$. Use $\alpha = 0.05$.