STAT 477/STAT 577
HW 9 - Module 3: Sections 3 through 6

1. In the 1998 General Social Survey, respondents were classified according to their sex, race, and belief in an afterlife. The data are given in the table below. The data file for analysis (**afterlife.csv**) is located with this assignment in Canvas.

		Belief in Afterlife		
Race	Sex	Yes	Undecided	No
White	Female	371	49	74
	Male	250	45	71
Black	Female	64	9	15
	Male	25	5	13

   (a) Give the equation for predicting the probability for each of the three categories (using Belief in Afterlife = No as the baseline category) from a person's race and sex using a nominal regression model.

   (b) Use the model from part (a) to estimate the probabilities for each of the three categories for belief in afterlife for all four combinations of sex and race.

   (c) Test for the significance of sex in the model for predicting belief in the afterlife.

   (d) Test for the significance of race in the model for predicting belief in the afterlife.

2. The following table of counts was obtained from a random sample of 1,397 respondents from the population of adults (more then 18 years old) in the United States in 1982. Each respondent was cross-classified with respect to opinions regarding gun registration as a part of comprehensive gun control legislation and imposing the death penalty on adults convicted of certain violent acts. The data file for analysis (**gunpenalty.csv**) is located with this assignment in Canvas.

	Death Penalty	
Gun Registration	Favor	Oppose
Favor	784	236
Oppose	311	66

   (a) Fit the log linear model for the counts in the contingency table under the assumption of independence. Set the baseline categories for both variables to Oppose. Use the estimated coefficients to calculate the four expected counts in the table. Does this model fit the data? Explain your answer.

   (b) Fit the saturated log linear model for the counts in the contingency table, again using the category Oppose as the baseline category. Use the model to obtain the odds ratio for the table and interpret its value.

3. During the semester, we have looked at survey data on shower habits collected from students in STAT 101 at Iowa State University. In the survey data, we asked students to specify which direction they face (either toward the shower or away from the shower) when wetting, lathering, and rinsing their hair. The three-way cross-classification table for the three variables, Wet, Lather, and Rinse is given below. The data file for analysis (**shower.csv**) is located with this assignment in Canvas. Set the baseline categories for all three variables to the category Toward.

		Rinse	
Wet	Lather	Toward	Away
Toward	Toward	198	44
	Away	273	72
Away	Toward	26	515
	Away	74	621

Find the log-linear model that best fits the counts in the data table. Then, give an interpretation of all interaction terms in this model.