Math 152, Fall 2007
Professor Hardin
HW #12

From the book: 9.1: 4, 5, 8; 9.3: 1, 2, 4
In addition:

1. Consider the situation with r rows and c=2 columns. For the situation in section 9.3 of your book, testing independence of two variables (the variable in the rows vs. the variable in the columns),

	group 1	group 2	
sample 1	x_1	y_1	n_1
sample 2	x_2	y_2	n_2
	...	...	
sample r	x_r	y_r	n_r

   (a) show that $\chi_1^2 = \chi_2^2$,

$$\chi_1^2 = \sum_{i=1}^{r} \frac{(x_i - n_i\hat{\theta})^2}{n_i\hat{\theta}(1-\hat{\theta})}$$
$$\chi_2^2 = \sum_{i=1}^{r}\sum_{j=1}^{2} \frac{(f_{ij} - e_{ij})^2}{e_{ij}}$$

   where:

$$\hat{\theta} = \frac{x_1 + x_2 + \cdots + x_r}{n_1 + n_2 + \cdots + n_r}$$
$$e_{ij} = \text{the expected counts in the ij cell}$$
$$f_{ij} = \text{the observed counts in the ij cell}$$

   (b) What are the degrees of freedom associated with χ_1^2 and χ_2^2?

   (c) What is the distribution of χ_1^2? Justify your answer using knowledge previous to chapter 9.