Homework 7
Math 183, UCSD, Fall 2017

Do not turn in!

Exercise 1

In this exercise, U_n denotes a random variable having χ^2-distribution with n degrees of freedom. Using the tables of the textbook only, find the best bounds you can for:

1. $P(U_5 < 6.5)$; (give an answer of the form $a \leq P(U_5 < 6.5) \leq b$)

2. the value u^* such that $P(U_{18} \leq u^*) = 0.95$;

3. the value u^* such that $P(U_9 > u^*) = 0.034$. (answer of the form $a' \leq u^* \leq b'$)

Exercise 2

A Gallup Poll released in December 2010 asked 1019 adults living in the Continental U.S. about their belief in the origin of humans. These results, along with results from a more comprehensive poll from 2001 (that we will assume to be exactly accurate), are summarized in the table below

2010	2001	Response
38%	37%	Humans evolved, with God guiding
16%	12%	Humans evolved, but God had no part in the process
40%	45%	God created humans in the present form
6%	6%	Other/No opinion

1. Calculate the actual number of respondents in 2010 that fall in each response category.

2. State hypotheses for the following research question: have beliefs on the origin of human life changed since 2001?

3. Calculate the expected number of respondents in each category under the condition that the null hypothesis from question 2 is true.

4. Conduct a χ^2-test and state your conclusion.

5. Were all the conditions fulfilled to use a χ^2-test?

Exercise 3

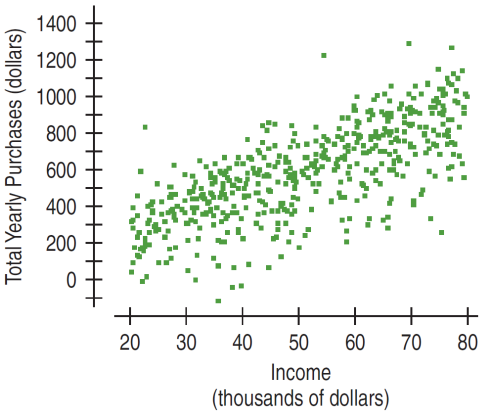
A total of 1154 girls attending a public high school were given a questionnaire that measured how much each had exhibited delinquent behavior. From an analysis of the results, the researchers categorized 111 of the girls as "delinquent". The following table is a cross-classification of the delinquents and the non-delinquents according to their birth order.

	Delinquent	Non Delinquent
Oldest	24	450
In Between	29	312
Youngest	35	211
Only Child	23	70

At the $\alpha = 0.01$ level of significance, is there evidence here to support the contention that birth order and delinquency are related?

Exercise 4

An local clothing retailer keeps track of its customers' purchases using a loyalty card system. For these customers, the scatterplot and summary statistics of *Total Yearly Purchases* and *Income* are:



	Mean	SD
Income	\$50,343.40	\$16,952.50
Total Yearly Purchase	\$572.52	\$253.62

The correlation between *Total Yearly Purchases* and *Income* is 0.722.

1. What is the regression equation for predicting *Total Yearly Purchase* from *Income*?

2. Do the assumptions and conditions for regression appear to be met? Explain.

3. Interpret the slope and the intercept in the context.

4. What is the predicted average *Total Yearly Purchase* for someone with a yearly *Income* of \$20,000? For someone with an annual *Income* of \$80,000?

5. What percent of the variability in *Total Yearly Purchases* is accounted for by this model?

6. Compute the standard deviation s_e of the residuals. *(Hint: use the fact that* $R^2 = 1 - \frac{s_e^2}{s_y^2}$*)*

7. There were 500 customers in this survey. Construct a 90% C.I. for the true regression slope.

8. If a customer purchased \$620 of clothes in the year, how much do you expect his/her income to be?