Quiz 6

Your Name:

Duration of the Quiz is 25 minutes. There are two problems, worth 20 points. Show all your work for full credit. Books, notes etc. are prohibited.

(1) Fine needle aspiration (FNA) is a technique in which a small sample of the tumor is taken using a needle and visually inspected through a microscope. The data below represent 37 FNA slide samples. Slides with smooth ellipsoid-shaped nuclei were classified as "round" and slides with poorly shaped cell nuclei were classified as "concave." A biopsy was also conducted on each of these samples to determine if each was malignant or benign.

	Malignant	Benign	Total
Concave	17	4	21
Round	7	9	16
Total	24	13	37

- (a) What are the largest and smallest possible values for n_{11} in this problem?
- (b) Let's say that we use a Fisher's Test to find the *p*-value associated with a test to claim that concave cells are more likely to be malignant. Write down the null hypothesis and alternative hypothesis.
- (c) Compute the *p*-value. You do not have to find the exact value. You may leave your answer in terms of binomial coefficients.

(d) What is the *p*-value for the test if we instead used the mid-p-value approach

(2) The following table is from an article that studied effects of racial characteristics on whether subjects convicted of homicide receive the death penalty. The 674 subjects were the defendants in indictments involving cases with multiple murders, in Florida between 1976 and 1987.

Victims'	Defendant's	Death Penalty		Percentage
Race	Race	Yes	No	Yes
White	White	53	414	11.3
	Black	11	37	22.9
Black	White	0	16	0.0
	Black	4	139	2.8
Total	White	53	430	11.0
	Black	15	176	7.9

Source: M. L. Radelet and G. L. Pierce, *Florida Law Rev.*, **43**: 1–34, 1991. Reprinted with permission of the *Florida Law Review*.

- (a) Report the estimated odds ratio of death penalty verdict for white versus black, conditional on victim's race. Interpret.
- (b) Which test would you use to test the homogeneous association between death penalty verdict and defendant's race?
- (c) Which test would you use to test the independence between death penalty and defendant's race, conditional on victim's race.
- (d) Compute the marginal odds ratio between death penalty verdict and defendant's race.
- (e) Do we have evidence of Simpson's paradox in this particular problem? Why or why not?
- (f) Assuming homogeneous association, find the Mantel-Haenszel estimate of the common odds ratio.

			$\sum_{k=1}^{n} a_k d_k$
	Y = 1	Y = 0	$\sum_{k} \overline{n_k}$
X = 1	a_k	b_k	$\hat{\theta}_{MH} = \frac{k=1}{\kappa}, n_k = a_k + b_k + c_k + d_k$
X = 0	c_k	d_k	$\sum_{k=1}^{N} \frac{b_k c_k}{c_k}$
			$\sum_{k=1}^{n} n_k$