Tutorial 5

Question 1

(a) (10.46) Consider the large sample α-level test of

$$H_0 : \theta \leq \theta_0 \quad \text{vs} \quad H_1 : \theta > \theta_0,$$

which rejects the null hypothesis if

$$\frac{\hat{\theta} - \theta_0}{\sigma_{\hat{\theta}}} > z_\alpha.$$

Show that this is equivalent to rejecting H_0 if θ_0 is less than the $100(1-\alpha)\%$ lower confidence bound for θ.

(b) (10.48) Consider the large sample α-level test of

$$H_0 : \theta \geq \theta_0 \quad \text{vs} \quad H_1 : \theta < \theta_0,$$

which rejects the null hypothesis if

$$\frac{\hat{\theta} - \theta_0}{\sigma_{\hat{\theta}}} < -z_\alpha.$$

Show that this is equivalent to rejecting H_0 if θ_0 is greater than the $100(1-\alpha)\%$ upper confidence bound for θ.

Question 2

(10.106) A survey of voter sentiment was conducted in four midcity political wards to compare the fraction of voters favouring candidate A. Random samples of 200 voters were polled in each of the four wards, with the results as shown in the table below. The number of voters favouring A in the four samples can be regarded as four independent binomial random variables.

(a) Construct a likelihood ratio test of the hypothesis that the fractions of voters favour candidate A are the same in the four wards.

(b)  Using the data provided in the table below, carry out the hypothesis test using $\alpha = 0.05$.

	Ward				
Opinion	1	2	3	4	Total
Favor A	76	53	59	48	236
Do not favor A	124	147	141	152	564
Total	200	200	200	200	800

Question 3

(10.124) The data in the table below gives readings in foot-pounds of the impact strength of two kinds of packaging material, type A and type B. Determine whether the data suggests a difference in mean strength between the two kinds of material. Test at the $\alpha = 0.10$ level of significance.

A	B
1.25	.89
1.16	1.01
1.33	.97
1.15	.95
1.23	.94
1.20	1.02
1.32	.98
1.28	1.06
1.21	.98
$\sum y_i = 11.13$	$\sum y_i = 8.80$
$\overline{y} = 1.237$	$\overline{y} = .978$
$\sum y_i^2 = 13.7973$	$\sum y_i^2 = 8.6240$