STAT505 Assessment #6

1. J&W Exercise 6.24. The data can be found in "skulls.dat".

2. Three peanut varieties (coded 5, 6, 8) are grown in two geographical locations (coded 1,2). There were two replications (growing plots) per combination of variety and location. The variables are X_1 = yield (weight), X_2 = sound mature kernels (weight), and X_3 = seed size.

   The data for this problem is in "peanut.dat". The following program reads the data into SAS, computes a two-factor MANOVA (and univariate ANOVAs), gives results for pairwise contrasts among varieties, gives means for the factors in the model, and does tests of normality for the residuals (output also included separately on ANGEL).

```
data peanut;
infile "v:\peanut.dat";
input location variety x1 x2 x3;
run;
proc glm;
class location variety;
model x1 x2 x3 =location variety location*variety;
contrast 'diff56' variety 1 -1 0;
contrast 'diff58' variety 1 0 -1;
contrast 'diff68' variety 0 1 -1;
lsmeans location variety location*variety;
manova h = _all_;
output out = resids r = res1-res3;
run;
proc univariate normal;
var res1 res2 res3 ;
run;
```

   (a) In the output, locate the MANOVA tests for the location factor. What is the p-value and what conclusion can we make?

   (b) In the output, locate the MANOVA tests for the variety factor. What are the p-values for the four different tests and what conclusion can we make?

   (c) In the output, locate the MANOVA tests for the location*variety interaction factor. What are the p-values for the four different tests and what conclusion can we make?

   (d) Locate the univariate ANOVAs for the three variables. Briefly summarize the results; that is, for each variable, what are the significant factors?

   (e) Locate the MANOVA test for the 'diff56' contrast, the difference between varieties 5 and 6. What is the p-value, and what conclusion can we make?

   (f) Repeat part e) for the 'diff58' contrast.

   (g) Repeat part e) for the 'diff68' contrast.

   (h) Locate the univariate test results for the 'diff56' contrast. For which variables is there a significant difference between varieties 5 and 6?

   (i) Repeat part h) for the 'diff58' contrast.

   (j) Repeat part h) for the 'diff68' contrast.

   (k) Locate the tests of normality for the three residual variables (res1, res2, res3). Four tests are given, but we'll use just the Wilk-Shapiro test. The null hypothesis is that the residuals have a normal distribution. What can we conclude about the normality of the residuals? Briefly explain.