**Review questions for WFSC 670, *Excel Biometry***

What is a *P* value?

What is the type of distrubution exibited by values produced by rand()?

What are Gaussian, normal, *t*, *F* and *z* distributions. Draw each with mean and std dev. indicated.

What does the central limit theorem (**CTL**) state and how does it relate to the questions above?

Prove (demonstrate) the CTL in Excel.

Describe the meaning and consequences of variation in the three key parameters of the t statistic.

How is the t-statistic and its key parameters homologous to *F*, χ², and *Λ*?

What are the definitions and relationships between summed square deviations and crossproducts and variance and covariance?

What is the difference between covariance and correlation?

What is a covariate and how does it differ from other variables?

What is a design matrix? Describe how it transmutes categorical to numerical dimensions?

Articulate how variance among groups and variance along gradients are homologous concepts.

What is centering? Describe how centering is equivalent to expressing the data as deviations.

What is the relationship between **S** (SSCP), **H** and and **Cov**.

How is it that **X̣**'**X̣** (where the under-dot indicates centering) literally equals SSx?

(i.e. describe meaning of the undercarat and mechanics and consequences of the matrix multiplication operation)

What is the reason we calculate **B** with **X**'**X** in the denominator? (this will be difficult to answer as I have not articulated the full reasoning in class)

Describe in words what **B** is. (hint: use the words/phrases ‘covariance’ and ‘standardized to’ in your answer)

How does one deal with curvilinear ralationships in parametric statistics?

What are the major assumptions of parametric stats (i.e. GLM)?

How can one deal with violations of these assumptions?

What is the difference between a constrained and unconstrained ordination?

If one were to ordinate known taxa in multivariate morphometric, physiological, genetic, or habitat space, would one do PCA or CA? Why? What about unknown taxa (for purposes of assigning taxonomic groups)?

Write a permutation of the following datablocks as if permuting to test significance of **Y** = *f*(**X**)

 **X** **Y**

1 2 7 8 9

3 4 0 0 0

5 6 1 1 1

Why is it so that **Ỵ̂**'**Ỵ̂** = **XB**'**XB** = **H**?

How does one determine the aspect ratio of multivariate plots?

What is the utility of structural equation modeling?

What is ηp²?

Not discussed explicitly but you should be able to answer the following from what you learned this semester... what (conceptually) is tr(**Heffect**) / tr(**SSCP**) ? Discuss.

Which is more important in a statistical test for an effect, *Peffect* or tr(**Heffect**) / tr(**SSCP**) ? Why?

Describe how variance and determinants measure differently the size of a data cloud.

What words describe the shape of a datacloud in 2, 3, and > 3 dimensions?

Describe the issues surrounding and some solutions in the sphere of data scaling.

What is a χ tranformation and why is it useful in parametric analysis?

Why are weighted *z*-scores used in CCA? (hint: answer has two parts)

What is the function of the L matrix?

Distinguish covariance and crossvariance.

How does one decompose crossvariance? (hint: it often is not a square matrix)

How does one rigidly rotate a data cloud? Why would you do so?

Describe how standardizing data in same units distorts data geometry.

Be able to conduct the following in Excel:

* Multivariate GLM (e.g. MANOVA, regression, MANCOVA)
* PCA
* CCA
* PLS
* t-test (using the multivariate GLM equations)

Be able to calculate the magnitude of a vector or volume of a data matrix.

Be able to interpret multivariate data plots (e.g. from CCA or MANOVA).

What is R² and how is it calculated?

What is Markov chain Monte Carlo optimization (presented in 13 Nov. lecture)

Distinguish various distance measures in stats, especially Euclidean and canonical distances.

Be aware of contributions made by major luminaries in the brief history of statistics (e.g. Pearson, Fisher, Wright, Nightingale).