STAT 547 Quiz 9 Name: ____________________

I expect you to read all of Chapter 9. Ideally you would do all of Exercises 9.1 through 9.8 for your own edification. These questions have been chosen to improve your understanding of the material. All but the last should be pretty easy once you understand things.

1. Show that if W and Y are random vectors with $\mathrm{E}(W) = \gamma$ and $\mathrm{E}(Y) = \mu$, then
$$\mathrm{E}(Y'AW) = \mathrm{tr}\,[A\mathrm{Cov}(W,Y)] + \mu' A\gamma.$$
(This is a minor modification of Theorem 1.3.2 in *PA*.)

2. Do Exercise 9.1 on page 358 (shortly before Sec. 9.1.)

3. Rewrite the multivariate linear model as a univariate linear model. (Just copy the appropriate part of the book.)

4. Do Exercise 9.10.9. (Two equivalent ways of looking at things. We will want both eventually.)

5. With regard to Example 9.3.1, suppose we have a third dependent variable y_3. Find a formula for the sample partial correlation, say $r_{12\cdot x3}$, for the correlation between y_1 and y_2 given x and y_3 that is analogous to the displayed formula for $r_{y\cdot x}$. (Apply *PA* Sec. 9.1. This is easy if you understand it.)

6. Do Exercise 9.2.

7. Do Exercise 9.3 (In part a, only do it for E.)

8. Show the first part of Exercise 9.4 and write down the second part. (Yes, merely write it down. You will remember what it says better if you have to write it down.)

9. Our test statistics depend on HE^{-1}. How do we know that E^{-1} exists?

10. Regarding Subsection 9.6.1, give all of the eigenvalues of the $q \times q$ matrix H other than the largest one. Why is this true?

11. Do Exercise 9.10.8.

12. Do Exercise 9.10.10. In Chapter 5 we discussed the fact that maximum likelihood estimates of variance components cannot be negative. The rationale here is similar.

13. Do Exercise 9.10.11. This is BY FAR the hardest problem and I am giving it to you because it should help your understanding of Chapter 4, not Chapter 9.