STAT 505 Assessment #8 (Exam)

Due by 11:59pm (Eastern), Monday, July 11

Academic Integrity

The Academic Integrity practices for the Eberly College of Science as described on the following website http://science.psu.edu/current-students/Integrity/Policy.html and are outlined below for this examination:

All course work by students will be done on an individual basis. Any reference materials used in the preparation of an assignment, whether quoted or paraphrased, must be explicitly cited. For this take-home examination, violations of academic integrity shall consist of any attempt to receive assistance from any person or papers or electronic devices, or of any attempt to give assistance, whether the student doing so has completed his or her own work or not. Other violations include, but are not limited to, any attempt to gain an unfair advantage in regard to an examination, such as tampering with a graded exam or claiming another's work to be one's own.

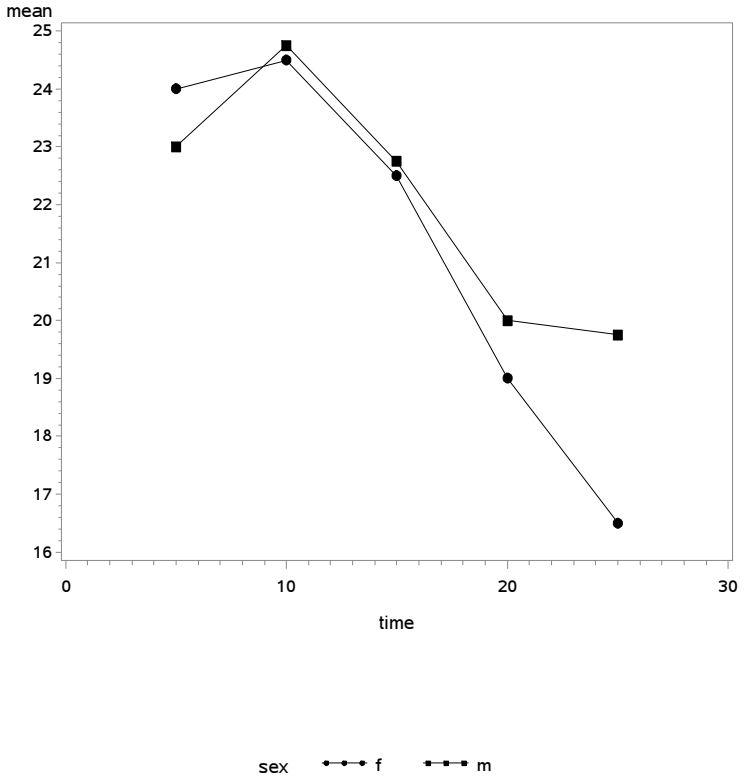
Directions

1. All questions regarding this exam must be directed to the instructor.
2. Write neatly and clearly when completing any handwritten portion of this exam.
3. To receive partial credit for a problem you must show all your work if done by hand. If using SAS, you should include your code.

1. Eight individuals were given a drug to measure the effect of a soporific effect on alertness. They were measured 5, 10, 15, 20, and 25 minutes afterward. At each time point, each person's response time (in hundredths of a second) to a stimulus was recorded. Each person's sex was also recorded for consideration. Output for the code below is available in "ex2_drug.pdf".

```
proc glm data=drugs;
 class sex;
 model t1-t5 = sex;
 manova h=sex m=t2-t1,t3-t2,t4-t3,t5-t4;
 manova h=sex m=t1+t2+t3+t4+t5;
 run; quit;
```

(a) With time on the horizontal axis and response value on the vertical axis, the profile plot below compares the two sexes. In words, what does interaction mean in this situation? If there were no interaction present, what would the profile plot above be expected to look like?



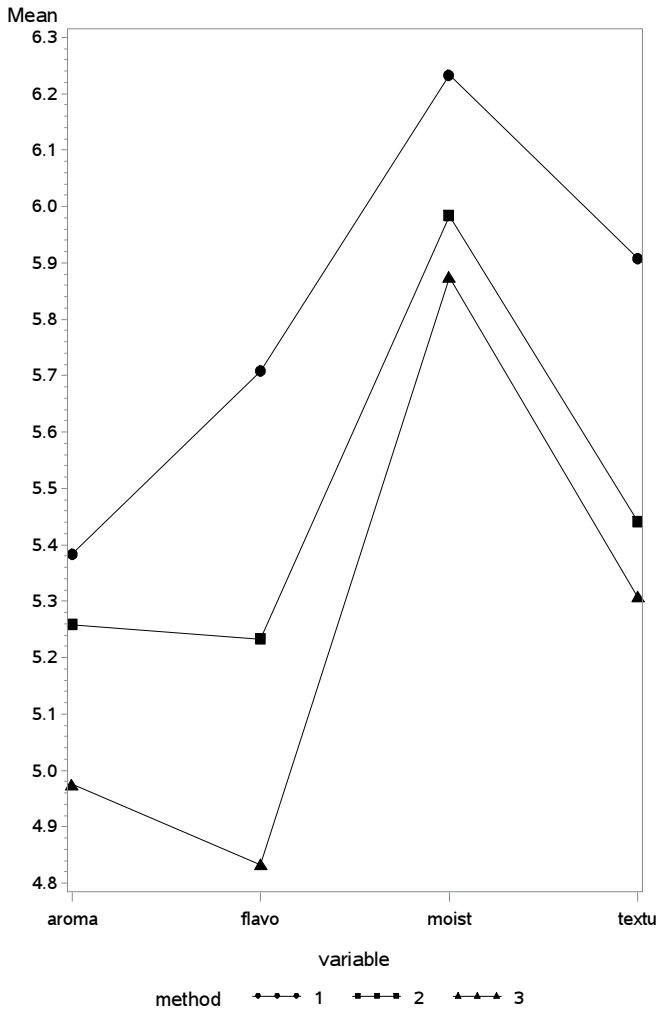
(b) Use the output to carry out the test of interaction. State the test statistic and conclusion with $\alpha = .05$.

(c) Is there an effect due to sex? Use $\alpha = .05$ to conduct the appropriate test, based on the output. Also, comment on the appropriateness of this test in light of your results above in the test for interaction.

2. In a study comparing attributes of fish preparation, three methods were compared. Variables recorded were aroma score, flavor score, texture score, moisture score. Twelve fish were prepared under each method.

   (a) State the MANOVA model for this situation. Specifically, what does Y_{ijk} represent in this situation?

   (b) The profile plot below is for the method mean scores with attributes along the horizontal axis. Use it to comment on the evidence for a method effect. How would the lines be expected to look under the assumption of no method effect?



Output for the following code is available in the separate file "ex2_fish.pdf". Use it to answer parts c) and d).

```
proc discrim pool=test data=fish; *passes with small samples;
  class method;
  var aroma flavor texture moisture;
  run;
proc glm data=fish;
  class method;
  model aroma flavor texture moisture = method;
  manova h=method;
  run; quit;
```

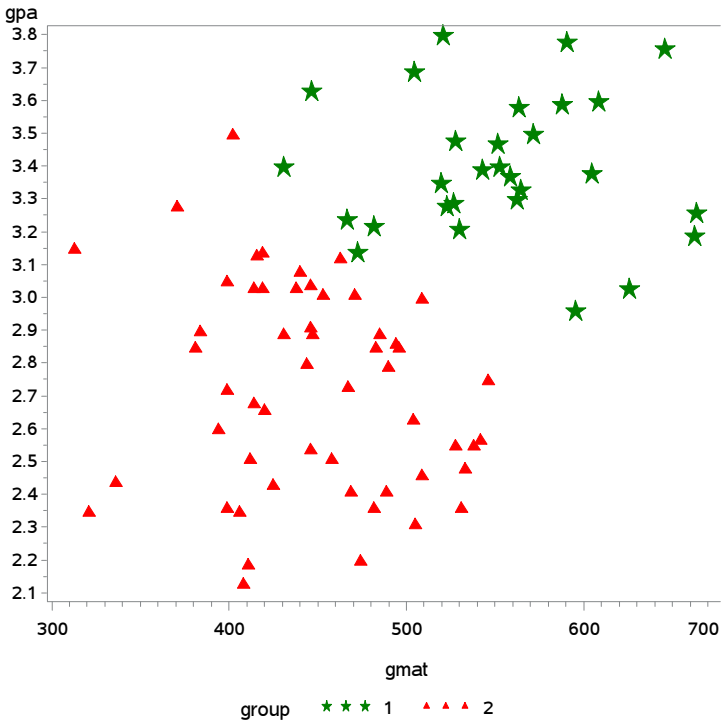
(c) Are the methods significantly different for any attributes? Answer with the appropriate hypothesis test(s). State the hypotheses, test statistic(s), p-value(s), and conclusion(s) at the .05 level of significance.

(d) What assumption does the MANOVA model make about $Cov(Y_{ijk})$? Is it reasonable here? Justify your answer from the output.

3. Information on past students who have applied to a graduate program is used to study future acceptances. Variables are college GPA, GMAT score, and whether the student was accepted (1 = yes, 2 = no). Output for the following SAS code is available in the file "ex2_grad.pdf".

```
proc discrim data=grad pool=yes;
  class group;
  var gpa gmat;
  priors '1'=1 '2'=1;
  run;
```

(a) The plot below is of GPA versus GMAT, using separate symbols for the acceptance status. Comment on the appropriateness of these variables as discriminators of admittance.



(b) Use the discriminant analysis for classifying an applicant based on GPA and GMAT score, and apply the results to the existing observations to classify them as either accepted or rejected. What fraction of them are classified correctly?

(c) From this analysis, what is the posterior probability of accepting a student with GPA and GMAT score of 2.9 and 550, respectively?

(d) Before consideration of a student's GPA and GMAT scores, what assumption is made about a student's probability of acceptance for this analysis?