Sample exam header and problems:

Some people do not read exam instructions, either because they are worried about time, or because they are barely conscious immediately after entering the exam room. It would be more productive to relax, take a deep breath and start the test in good spirits, but not everyone can do it. So here is the actual header from the final exam. Please read the instructions carefully before the exam.

Below the sample header you may find some sample problems if I have time to compose some. The number of problems below is in no way indicative of the length of the actual test.

Mth 306 Exam | **Name:** **ID:**

Bent Petersen `306w2005-exam.tex` Tuesday, March 15 2005, 18:00 Time: 110 minutes.

Instructions: $\Longrightarrow$
If you do not read the instructions, then how will you know what to do? Read them now.

Be sure to enter all required information on the scantron and on this test.

Section Number: 001
Form Number: 001

- *This test is mostly multiple-choice but may contain some workout workout problems. You must turn in both the test and the scantron.*
- *For the multiple-choice problems you must mark your answer on the provided scantron. Fill in the appropriate bubbles on the scantron very carefully.*
- *For the workout problems you must show your work in reasonable detail on the test. Partial credit is allocated only for clear and relevant work.*
- *You may use one 8.5×11 inch note sheet prepared in advance. You may write on both sides of your note sheet.*
- *Note sheets may not be shared. If you do not bring a note sheet you will have to do without any help notes.*
- *You may not use any books, notebooks, additional note sheets nor note cards.*
- *You are expected to have a simple scientific calculator available for use on this test. Calculators and other equipment may not be shared.*
- *You may use a simple graphics calculator but not a laptop computer nor any device capable of extensive symbolic manipulation (other than your own brain).*
- *There are yy multiple-choice problems worth 8 points each and xx work-out problems worth 20 points each.*

Important Notes:

- Note that $\log(x)$ means the *natural logarithm* of x, sometimes denoted by $\ln(x)$. The logarithm with base 10 will be denoted by $\log_{10}(x)$, the logarithm with base 2 will be denoted by $\log_2(x)$, and so on.
- If you are taking this test in the Mathematics Learning Center you will not need a scantron. Just be sure to write the letters corresponding to your answers in the boxes provided below.

Problem 1. If $A = \begin{bmatrix} 2 & 2 \\ -2 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 1 \\ 2 & -2 \end{bmatrix}$ then compute $AB - BA$.

Problem 2. The system of linear equations

$$\begin{bmatrix} 2 & -3 & 3 \\ 1 & -3 & 1 \\ 1 & 3 & 3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 2 \\ 1 \\ 1 \end{bmatrix}$$

has

A.) no solutions. **B.)** exactly one solution.

C.) infinitely many solutions. **D.)** a 2 dimensional solution space. **E.)** None of the foregoing.

[ ] ←*Write letter corresponding to your answer here and mark it on the scantron (Problem 2).*

Problem 3. The vector $[1, 2, 2]^T$ is an eigenvector of the matrix

$$A = \begin{bmatrix} -7 & -2 & 7 \\ -10 & 1 & 7 \\ -10 & -4 & 12 \end{bmatrix}.$$

Find the corresponding eigenvalue.

A.) -2 **B.)** 0

C.) 3 **D.)** 5 **E.)** None of the foregoing.

☐ ←*Write letter corresponding to your answer here and mark it on the scantron (Problem 3).*

Problem 4. One of the eigenvalues of the matrix

$$A = \begin{bmatrix} 6 & 0 & -2 \\ 0 & -1 & 0 \\ -3 & 0 & 9 \end{bmatrix}.$$

is 10. Find the other eigenvalues and for each eigenvalue find a corresponding eigenvector. Find an invertible matrix S such that $S^{-1}AS$ is diagonal.