MAT 1341 Test 2

Summer 2007

July 4

Instructor: Charles Starling

Family Name:_____

First Name:_____

Student Number: _____

Question	Response	Points
1		
2		
3		
4		
5		
6	–	
7	–	
Total	–	

PLEASE READ THESE INSTRUCTIONS VERY CAREFULLY.

1. You have 80 minutes to complete this exam.
2. This is a closed book exam, and no notes of any kind are allowed. **Do not use your own scrap paper! Use the last page or the backs of pages for rough work**.
3. The use of calculators, cell phones, pagers or any text storage or communication device is not permitted.
4. Questions 1 through 5 are multiple choice. They are worth 2 points each and no part marks will be given. Please record your answers in the space provided above.
5. Questions 6 and 7 require a complete solution, and are worth 6 points each, so spend your time accordingly. **The correct answer requires justifcation written legibly and logically: you must convince me that you know why your solution is correct. You must answer these questions in the space provided.** Use the backs of pages if necessary.
6. Where it is possible to check your work, do so.
7. Good luck! Bonne chance!

1. If $\begin{vmatrix} a & b & c \\ d & e & f \\ g & h & i \end{vmatrix} = 4$, find $\begin{vmatrix} 4g & a & d-2a \\ 4h & b & e-2b \\ 4i & c & f-2c \end{vmatrix}$.

A. 10
B. -10
C. 40
D. -40
E. 20
F. -20

2. For a non-homogeneous system of 19 equations in 13 unknowns, answer the following three questions:

- Can the system be inconsistent?
- Can the system have a unique solution?
- Can the system have infinitely many solutions?

A. Yes, No, No.
B. Yes, Yes, No.
C. Yes, No, Yes.
D. Yes, Yes, Yes.
E. No, Yes, Yes.
F. No, No, No.

3. If $B = \begin{bmatrix} 1 & 1 & -1 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix}$, then the second row of B^{-1} is

A. $[0, 1, -1]$
B. $[-1, 1, 0]$
C. $[0, -1, 1]$
D. $[1, -1, 0]$
E. $[1, 0, -1]$
F. None of the above.

4. The vectors $u_1 = (3, 0, 4), u_3 = (0, 1, 0)$, and $u_3 = (-4, 0, 3)$ form an orthogonal set. Let $v = (0, 1, 1)$. Find (a_1, a_2, a_3) such that $v = a_1u_1 + a_2u_2 + a_3u_3$.

A. $(4/5, 1, 3/5)$
B. $(4, 1, 3)$
C. $(4/25, 1, 3/25)$
D. $(0, 1, 1)$
E. $(-4/25, 1, 3/25)$
F. $(4/25, 1, -3/25)$

5. Which of the following statements is true?

2. If A is an $n \times 2$ matrix and $B = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$ then the second column of the matrix AB is

A. the same as the second column of B.
B. the same as the first column of A.
C. the same as the first column of B.
D. the same as the second column of A.
E. the sum of the first and the second columns of A.
F. not defined unless $n = 2$.

6. Let $A = \begin{bmatrix} 1 & 2 & -1 & 4 \\ 5 & 10 & -4 & 19 \\ 3 & 6 & -3 & 12 \end{bmatrix}$.

(a) Find a basis for $\text{row}(A)$, the rowspace of A.

(b) Find a basis for $\text{col}(A)$, the columnspace of A.

(c) Find the dimension of $\{Ax \mid x \in \mathbb{R}^4\}$.

(d) Find the dimension of $\ker(A) = \{x \in \mathbb{R}^4 \mid Ax = 0\}$.

(e) Check that $\dim \ker(A) + \text{rank}(A) = 4$.

7.(a) State whether the following are true or false and justify your answer.

i) There is a 4×3 matrix A such that $Ax = b$ is consistent for every $b \in \mathbb{R}^4$.

ii) If A is a 2×2 matrix and $A^2 = 0$, then $A = 0$.

7(b). Let A be an $n \times n$ matrix. Give a statement equivalent to

"A is **NOT** invertible."

in terms of:

i) The columns of A.

ii) The homogeneous system $Ax = 0$.

iii) The rank of A.

This page left intentionally (almost) blank.