Name: _____ ID#: _____

Midterm II

Math 20
Introduction to Linear Algebra and Multivariable Calculus

November 18, 2005

Rules:

- This is a one-hour exam.
- Calculators are not allowed.
- Unless otherwise stated, show all of your work. Full credit may not be given for an answer alone.
- You may use the backs of the pages or the extra pages for scratch work. *Do not unstaple or remove pages as they can be lost in the grading process.*
- Please do not put your name on any page besides the first page. If you like, you may put your ID number on the top of each page you write on.

Hints:

- Read the entire exam to scan for obvious typos or questions you might have.
- Budget your time so that you don't run out.
- Problems may stretch across several pages.
- Relax and do well!

Students who, for whatever reason, submit work not their own will ordinarily be required to withdraw from the College.
—Handbook for Students

Problem Number	Possible Points	Points Earned
1	10	
2	10	
3	10	
4	10	
5	10	
Total	50	

1 1

1. (10 Points) Let

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

Find the inverse of A.

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2 2

2. (10 Points) Let

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

Find a basis for $\mathbf{C}(A)$ and for $\mathbf{N}(A)$.

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3 3

3. (10 Points) Let

$$f\begin{pmatrix} x \\ y \end{pmatrix} = 3x^2 + 12x + 4y^3 - 6y^2 + 5.$$

Find all critical points of f and classify them (that is, determine whether each is a local maximum, a local minimum, or a saddle point).

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4 4

4. (10 Points) Find the minimum value of

$$f\begin{pmatrix} x \\ y \\ z \end{pmatrix} = x^2 + y^2 + z^2$$

subject to the constraint that

$$3x + 2y + z = 6.$$

(There is only one critical point of the constrained function; you don't need to test that it's a minimum. But do make sure you state the value of the function at that critical point).

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5 5

5. (10 Points) Find the least-squares line of best fit for the three points

$$\begin{bmatrix}1\\2\end{bmatrix}, \begin{bmatrix}2\\4\end{bmatrix}, \begin{bmatrix}3\\5\end{bmatrix}$$

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