Midterm Examination #1
Math 111
Algebra for Applications
Friday, October 2, 1998

§1 Computation:

1. Find the equation of the line through the point $(5,6)$ and having slope $\frac{3}{5}$.
2. Graph the feasible set for the system of inequalities $\begin{cases} x+2y \geq 8 \\ 3x+y \geq 6 \end{cases}$.
3. Solve the following linear system of equations by elimination. $\begin{cases} 3x-6y+9z=0 \\ 4x-6y+8z=-4 \\ -2x-y+z=7 \end{cases}$.
4. Perform the multiplication, or explain why it is not possible $\begin{bmatrix} 4 & -1 \\ 2 & \frac{1}{2} \end{bmatrix}\begin{bmatrix} 3 \\ 2 \end{bmatrix}$.
5. Compute the inverse of the matrix $\begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & -4 \\ 0 & 1 & -3 \end{bmatrix}$.

§2 Comprehension:

6. Describe two different forms of the equation of a line, explaining the meaning of each term
7. What are the rules for manipulating inequalities?
8. What is the identity matrix? Why is it important? What is the inverse of a matrix?

§3 Applications:

9. The temperature of water being heated in a tea kettle rises according to the equation $y = 20x + 72$, where y is the temperature in degrees Fahrenheit x minutes after the kettle was put on the burner.
    - After how many minutes will the water boil? (Water boils at 212^{o} Fahrenheit.)(But you knew that ☺)
    - What physical interpretation, if any, can be given to the y-intercept of the graph?
10. A teacher estimates that of the students who pass a test, 80% will pass the next test, while of those who fail a test, 50% will pass the next test. Let x and y denote the number of students who pass and fail a given test, and let u and v be the corresponding numbers for the second test.
    - Write a matrix equation relating $\begin{bmatrix} u \\ v \end{bmatrix}$ to $\begin{bmatrix} x \\ y \end{bmatrix}$.
    - Suppose that 25 of the teacher's students pass test #3. How many will pass test #4?
    - Write down (but do not evaluate) a matrix product that describes how many people passed and failed test #2.