18.06 Professor Strang Quiz 1 March 1, 2004

Grading

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Your name is: ______________________________

Please circle your recitation:

1)	M2	2-131	I. Ben-Yaacov	2-101	3-3299	pezz
2)	M3	2-131	I. Ben-Yaacov	2-101	3-3299	pezz
3)	M3	2-132	A. Oblomkov	2-092	3-6228	oblomkov
4)	T11	2-132	A. Oblomkov	2-092	3-6228	oblomkov
5)	T12	2-132	I. Pak	2-390	3-4390	pak
6)	T1	2-131	B. Santoro	2-085	2-1192	bsantoro
7)	T1	2-132	I. Pak	2-390	3-4390	pak
8)	T2	2-132	B. Santoro	2-085	2-1192	bsantoro
9)	T2	2-131	J. Santos	2-180	3-4350	jsantos

1 (30 pts.) For the system $Ax = b$ given by

$$\begin{bmatrix} 1 & 0 & 4 \\ 2 & 1 & 10 \\ 3 & 1 & c \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 6 \\ 14 \\ 20 \end{bmatrix}$$

(a) Find the value of c that makes the matrix A not invertible. *Use this value of* c in parts (b) and (c).

(b) Find the complete solution to $Ax = b$.

(c) Describe **EITHER** the column picture for the three columns of A and the column vector b, **OR** the row picture for the three equations in $Ax = b$.

2 (30 pts.) Suppose A has reduced echelon form R,

$$A = \begin{bmatrix} 1 & 2 & 1 & b \\ 2 & a & 1 & 8 \\ \multicolumn{4}{c}{(\text{row 3 of } A)} \end{bmatrix}, \qquad R = \begin{bmatrix} 1 & 2 & 0 & 3 \\ 0 & 0 & 1 & 2 \\ 0 & 0 & 0 & 0 \end{bmatrix}.$$

(a) What can you say about row 3 of A?

(b) What are the numbers a and b?

(c) Describe the nullspace of A.

3 (20 pts.) Suppose you have 4 column vectors u, v, w, z in 3-dimensional space $\mathbf{R}^3$.

(a) Give an example where the column space of a matrix A contains u, v, w but not z. [Tell us u, v, w, z, and A.]

(b) What are the dimensions of the column space and the nullspace of your A?

4 (20 pts.) (a) Factor this matrix A into $L\,U$ (lower triangular times upper triangular)

$$A = \begin{bmatrix} 2 & 3 & 1 \\ 4 & 5 & 2 \\ 4 & 6 & 0 \end{bmatrix}$$

(b) Is A invertible? YES NO