18.06 Professor Edelman Quiz 1 March 6, 2006

Grading

1

2

3

Your PRINTED name is: ____________________

Please circle your recitation:

1)	M 2	2-131	A. Kasimov	2-339	3-1715	kasimov
2)	M 3	2-131	A. Kasimov	2-339	3-1715	kasimov
3)	M 3	2-132	R. Lehman	2-251	3-7566	rclehman
4)	T 10	2-132	F. Liu	2-333	3-7826	fuliu
5)	T 11	2-132	P. Shor	2-369	3-4362	shor
6)	T 12	2-132	P. Shor	2-369	3-4362	shor
7)	T 1	2-131	F. Liu	2-333	3-7826	fuliu
8)	T 1	2-132	A. Osorno	2-229	3-1589	aosorno
9)	T 2	2-132	A. Osorno	2-229	3-1589	aosorno

1 (30 pts.) Let

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

(a) By eliminating, prove that the column space consists of those vectors $(x, y, z)^{\mathrm{T}}$ with $2x - y = 0$.

(b) By eliminating, prove that the row space consists of those vectors $(x, y, z)^{\mathrm{T}}$ with $y + z = 2x$.

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2 (40 pts.) For each of the eight cases below, exhibit a 3×3 matrix A with rank r and the specified condition or argue convincingly that it is impossible.

(a) $r = 0$, $\text{col}(A) = \text{row}(A)$

(b) $r = 1$, $\text{col}(A) = \text{row}(A)$

(c) $r = 2$, $\text{col}(A) = \text{row}(A)$

(d) $r = 3$, $\text{col}(A) = \text{row}(A)$

(e) $r = 0$, $\text{col}(A) \neq \text{row}(A)$

(f) $r = 1$, $\text{col}(A) \neq \text{row}(A)$

(g) $r = 2$, $\text{col}(A) \neq \text{row}(A)$

(h) $r = 3$, $\text{col}(A) \neq \text{row}(A)$

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3 (30 pts.) Let

$$A = \begin{bmatrix} 1 & a & 0 & d & 0 & g \\ 0 & b & 1 & e & 0 & h \\ 0 & c & 0 & f & 1 & i \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix} \quad \text{and} \quad v = \begin{bmatrix} p \\ q \\ r \\ s \end{bmatrix}$$

(a) Find the complete solution to $Ax = v$, if $s = 1$.

(b) Find the complete solution to $Ax = v$, if $s = 0$.

(*Hint:* Best if you don't work too hard!)

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