18.06 Professor Strang Quiz 1 October 5, 2005

Grading

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Your PRINTED name is: ____________________

Please circle your recitation:

1)	M 2	2-131	P. Lee	2-087	2-1193	`lee`
2)	M 2	2-132	T. Lawson	4-182	8-6895	`tlawson`
4)	T 10	2-132	P.-O. Persson	2-363A	3-4989	`persson`
5)	T 11	2-131	P.-O. Persson	2-363A	3-4989	`persson`
6)	T 11	2-132	P. Pylyavskyy	2-333	3-7826	`pasha`
7)	T 12	2-132	T. Lawson	4-182	8-6895	`tlawson`
8)	T 12	2-131	P. Pylyavskyy	2-333	3-7826	`pasha`
9)	T 1	2-132	A. Chan	2-588	3-4110	`alicec`
10)	T 1	2-131	D. Chebikin	2-333	3-7826	`chebikin`
11)	T 2	2-132	A. Chan	2-588	3-4110	`alicec`
12)	T 3	2-132	T. Lawson	4-182	8-6895	`tlawson`

1 (30 pts.) Suppose A is m by n with **linearly dependent columns**. Complete with as much true information as possible:

(a) The rank of A is ______________________________

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(b) The nullspace of A contains ______________________

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(c) (more words needed) The equation $A^{\mathrm{T}}y = b$ has no solution for some right hand sides b because ______________________

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2 (40 pts.) Suppose A is this 3 by 4 matrix:

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

(a) A specific basis for the column space of A is ______________.

(b) For which vectors $b = \begin{bmatrix} b_1 \\ b_2 \\ b_3 \end{bmatrix}$ does $Ax = b$ have a solution? Give conditions on b_1, b_2, b_3.

(c) There is no 4 by 3 matrix B for which $AB = I$ (3 by 3). Give a good reason (is this because A is rectangular?).

(d) Find the complete solution to $Ax = \begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix}$.

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3 (30 pts.)

(a) Find a basis for the vector space of all real 3 by 3 symmetric matrices.

(b) Suppose A is a square invertible matrix. You permute its rows by a permutation P to get a new matrix B. How do you know that B is also invertible?

(c) "If 2 matrices have the same shape and the same nullspace, then they have the same column space." **If this is true**, give a reason why. **If this is not true**, find 2 matrices to show it's false.

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