Staple!

Team: ______

Linear Algebra
MAS4105 5441

B-Home

Prof. JLF King
Touch: 6May2016

Hello. Your essays violate the CHECKLIST at *Your Peril*! Page numbers without citation refer to our textbook. Each member of the team must retain a *complete copy* of the team's problem-sheet and write-up, including diagrams. Exam is due **by 4:30PM Tues, 01Nov2005**. Write expressions unambiguously e.g, "$1/a+b$" should be bracketed either $[1/a]+b$ or $1/[a+b]$. (Be careful with **negative** signs!)

B1: Short answer: Show no work. Please write **DNE** in a blank if the described object does not exist or if the indicated operation cannot be performed.

___ ___ **z** Professor King sometimes gives freebie questions. Circle one: **True** **Right On!** ***Who?***

___ ___ **a** Let $\mathsf{R} := \begin{bmatrix} 1 & 3 \\ 2 & 0 \\ 0 & 1 \end{bmatrix}$. Find a particular left-inverse L to R; this left-inverse, L, should have its leftmost column all-zero. (Of nec., L is a 2×3 matrix.)

$\mathsf{L}=$ ______ and $\mathsf{LR}=$ ______.

___ ___ **b** Construct 2×2 matrices $\mathsf{A} \neq \mathbf{0}$ and non-sing Q so that $\mathsf{QAQ}^{-1} = \mathbf{0}$. (Of nec., the determinant of A is 0.)

$\mathsf{A}=$ ______ and $\mathsf{Q}=$ ______.

___ ___ **c⁺** Let $\mathsf{U}\colon \text{Poly}_{<3} \to \text{Poly}_{<3}$ by $\mathsf{U}(f) := 2f'' - f' + f$. Polynomials

$$b_0(x) := 1, \quad b_1(x) := x+3, \quad b_2(x) := x^2+1,$$

yield a basis $\mathcal{B} := (b_0, b_1, b_2)$. Compute the matrix

$[\mathsf{U}]_{\mathcal{B}}^{\mathcal{B}} =$ ______. $\text{Rank}(\mathsf{U}) =$ ______.

___ ___ **d** **#4(f)** *P.237*. (*Jog:* Det of complex matrix.)
Det= ______.

___ ___ **e⁺** The char.poly of square matrix S is

$$p_{\mathsf{S}}(x) := [x-2]^{52} + [x+3]^{45}.$$

So $\text{Trace}(\mathsf{S})=$ ______ and $\text{Det}(\mathsf{S})=$ ______.

B2: Consider 2×2 matrices A and B, satisfying $[\mathsf{A}+\mathsf{B}]^2 = \mathbf{0}$. Suppose $\mathsf{A}^2 = \begin{bmatrix} 31 & 12 \\ 18 & 7 \end{bmatrix}$ and $\mathsf{B}^2 = \begin{bmatrix} 29 & 12 \\ 12 & 5 \end{bmatrix}$ and $\mathsf{AB} = \begin{bmatrix} -29 & -12 \\ -17 & -7 \end{bmatrix}$. Compute, easily, the product matrix $\mathsf{A}^{-1}\mathsf{B}^{-1}=$ ______. [*Hint:* Use matrix algebra.]

B3: Carefully prove **#22** *P.109*. Then use it to prove **#22** *P.230*.

B4: Let $\mathsf{G} := \begin{bmatrix} 2 & 2 & -1 \\ 1 & 3 & -1 \\ -1 & -2 & 2 \end{bmatrix}$. In std.form, its char.poly is $p_{\mathsf{G}}(x) =$ ______. Counting with multiplicity, $\text{Evals}(\mathsf{G})=$ ______. Either show that G is not diagonalizable, or else compute diagonal matrix

$\mathsf{D}=$ ______ and non-sing $\mathsf{Q}=$ ______ so that $\mathsf{QDQ}^{-1} = \mathsf{G}$.

B5: Please give a rigorous proof of **#24** *P.230*. [*Hint:* Try induction on n, using either the cofactor, or general-diagonal, or rref method of computing determinants.]

End of B-Home

B1:	___ ___ ___	120pts
B2:	___ ___	85pts
B3:	___ ___ ___	185pts
B4:	___ ___ ___	105pts
B5:	___ ___	45pts
Total:	___ ___ ___	540pts

HONOR CODE: *"I have neither requested nor received help on this exam other than from my team-mates and my professor (or his colleague)."* *Name/Signature/Ord*

______ Ord:

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Filename: `Classwork/LinearAlg/LinA2005t/b-home.LinA2005t.latex`
As of: *Monday 31Aug2015.* Typeset: *6May2016 at 16:59.*