Staple!

Team: ____

Linear Algebra
MAS4105 5441

A-Home

Prof. JLF King
Touch: 6May2016

Please. General instructions are on the CHECKLIST. 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 Tuesday, 27Sep**. Do ***not*** approx.: If your result is "$\sin(\sqrt{\pi})$" then write that rather than .9797⋯.Use "$f(x)$ notation" when writing fncs; in particular, for trig and log fncs. E.g, write "$\sin(x)$" rather than the horrible $\sin x$ or $[\sin x]$. Write expressions unambiguously e.g, "$1/a+b$" should be bracketed either $[1/a]+b$ or $1/[a+b]$. (Be careful with **negative** signs!)

A1: 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 If $\lim_{x\to 0+} 8/x$ equals ∞, then $\lim_{x\to 0+} 5/x$ is Circle:

5 5 5

___ ___ a A 2×2 matrix E has $\mathsf{E}^2 = \mathbf{0}$ (the zero-matrix). Then E itself must be $\mathbf{0}$. Circle: **T** **F**

___ ___ b Let $\mathsf{M} := \left[\begin{smallmatrix}1&1\\0&1\end{smallmatrix}\right]$. Compute the 4105th power of M.
$\mathsf{M}^{4105} =$ ....

___ ___ c Suppose A, B and C are invertible $N\times N$ matrices. Express the following matrix as a product of terms A^{-1}, B^{-1}, and C^{-1} (raised to various powers): $[AB^2C^5AC^3]^{-1} =$ ....

___ ___ d,e Determine the inverse to $\mathsf{D} := \begin{bmatrix}0&-5&2\\2&-15&5\\-1&9&-3\end{bmatrix}$ using RREF.
$\mathsf{D}^{-1} =$ ....

A2: Consider these two 2×2 matrices:

$$\mathsf{R} := \begin{bmatrix}\sqrt{3}/2 & -1/2\\ 1/2 & \sqrt{3}/2\end{bmatrix} \qquad\text{and}\qquad \mathsf{A} := \frac{\sqrt{2}}{2}\cdot\left[\begin{smallmatrix}1&1\\-1&1\end{smallmatrix}\right].$$

Determine the matrix $[\mathsf{RA}]^{5441}$ via any method, and fill in the entries of the 2×2 blank matrix below. *Show no work.*

$$[\mathsf{RA}]^{5441} = \begin{bmatrix} & \\ & \end{bmatrix}.$$

[*Hint:* You don't need multiply matrices. Think of the linear trns that these matrices represent.]

A3: Let $S := \sqrt{3}$ and $K := \{q + rS \mid q, r \in \mathbb{Q}\}$. Prove that K is a field (see appendix). The crux is showing that $\frac{1}{q+rS}$ is in K.

A4: Let $\mathsf{M} := \begin{bmatrix}1&5&-1\\3&0&-6\\-2&-1&1\end{bmatrix}$. Viewing M as a *rational* matrix, compute:

A basis $\mathcal{R}$ for RowNullspace(M).

A basis $\mathcal{C}$ for ColSpan(M). Now write each M-col as an *explicit* linear-comb. of vectors in your $\mathcal{C}$.

Finally, interpret M as a $\mathbb{Z}_7$–matrix, and answer the same three questions.

A5: Solve (prove) #11P.85 concerning $\left[\begin{smallmatrix}\mathsf{A}&\mathsf{B}\\\mathbf{0}&\mathsf{C}\end{smallmatrix}\right]$.

End of A-Home

A1:	___ ___	60pts
A2:	___ ___	30pts
A3:	___ ___	50pts
A4:	___ ___	60pts
A5:	___ ___	55pts
Total:	___ ___ ___	255pts

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:

.... Ord:

.... Ord: