Prof. S. Brick **Math 237**
Fall '00 **section 2**

Linear Algebra; Quiz 0

1. Print your name. You must print it legibly.

2. What is your year in school and your major ?

3. What was the last math class you took ? From whom ? How did you do ?

4. What do you know about the following: matrix, vector, determinant ?

5. What other math classes do you plan to take ?

6. What grade do you honestly expect to get from this class ? Why ?

Prof. S. Brick | **Linear Algebra; Quiz 1** | **Math 237**
Fall '00 | | **section 2**

0. Print your name: ______________________________

1. Describe geometrically the set $\{(0,0,1)+s(1,0,0)+t(0,1,0)\,|\,s,t\in R\}$.

2. Find a formula using vectors describing the line $y=3x+1$.

3. Describe geometrically the set of vectors $v\in R^2$ with $(1,1)\cdot v\geq |v|$.

Prof. S. Brick **Fall '00**

Linear Algebra; Quiz 2

Math 237 **section 2**

0. Print your name: ______________________________

1. Express the solutions to the augmented matrix $\begin{pmatrix} 1 & 2 & 3 & 0 & 8 \\ 0 & 0 & 1 & 7 & 2 \end{pmatrix}$ using a parametric equation with translation and spanning vectors.

2. Find the reduced echelon form of the matrix $\begin{pmatrix} 1 & 0 & 2 & 0 \\ 4 & 2 & 16 & 1 \\ 0 & 0 & 1 & 5 \end{pmatrix}$

3. Suppose $a \neq 0$ but $ad - bc = 0$. Find the reduced echelon form of $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$

Prof. S. Brick **Linear Algebra; Quiz 3** **Math 237**
Fall '00 **section 2**

0. Print your name: ______________________________

1. Express $(2, 6, 5)$ as a linear combination of $(1, 0, -2)$ and $(0, 2, 3)$. Don't guess. Explain your reasoning.

2. Find the nullspace of the matrix $\begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 3 \\ 0 & 0 & 0 & 0 \end{pmatrix}$

3. Suppose $A = \begin{pmatrix} 1 & -2 & 3 \\ 7 & \frac{1}{2} & 4 \\ 0 & 0 & 6 \\ 9 & 1 & 0 \end{pmatrix}$ and $X = \begin{pmatrix} 1 \\ 4 \\ 2 \end{pmatrix}$. Compute the product AX.

Prof. S. Brick | **Linear Algebra; Quiz 4** | **Math 237**
Fall '00 | | **section 2**

0. Print your name: ______________________________

1. Prove that $\left\{(1,0,0,0),(0,2,3,0),(0,4,5,0)\right\}$ is linearly independent.

2. Find a spanning set for the nullspace of the matrix $\begin{pmatrix} 1 & 0 & 0 & 0 & 5 \\ 0 & 0 & 1 & 2 & 1 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$

3. Let P_2 be the vector space of polynomials of degree ≤ 2. Prove $\{1, x, x^2\}$ spans P_2.

Prof. S. Brick **Linear Algebra; Quiz 5** **Math 237**
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0. Print your name: ________________________________

1. Let A be a 7×5-matrix. Suppose its nullspace is a line. Find the dimension of its row space. Of what Euclidean space is its row space a subspace (i.e., R^n where $n =$?) ?

2. Suppose $A = \begin{pmatrix} a_{11} & a_{12} & a_{13} & a_{14} \\ a_{21} & a_{22} & a_{23} & a_{24} \\ a_{31} & a_{32} & a_{33} & a_{34} \end{pmatrix}$ row reduces to $\begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 2 \\ 0 & 0 & 0 & 0 \end{pmatrix}$.

Find a basis for the column space of the matrix A.

3. 2. Suppose $A = \begin{pmatrix} a_{11} & a_{12} & a_{13} & a_{14} \\ a_{21} & a_{22} & a_{23} & a_{24} \\ a_{31} & a_{32} & a_{33} & a_{34} \end{pmatrix}$ row reduces to $\begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 2 \\ 0 & 0 & 0 & 0 \end{pmatrix}$.

Find a basis for the row space of the matrix A.

Prof. S. Brick **Fall '00**

Linear Algebra; Quiz 6

Math 237 **section 2**

0. Print your name: ______________________________

1. Find the matrix of the linear map written with variables as $f(x, y, z) = (3y - 5z, 2x + 4y)$.

2. If $A = \begin{pmatrix} 4 & 0 & 3 & 5 \\ \pi & 17 & 0 & \sqrt{3} \\ 2 & 1 & 3 & 0 \end{pmatrix}$ is the matrix of a linear map f, find f using variables.

3. Compute A^4 where $A = \begin{pmatrix} 0 & 1 & 1 & 1 \\ 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{pmatrix}$.

Prof. S. Brick | **Linear Algebra; Quiz 7** | **Math 237**
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Linear Algebra; Quiz 7

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Fall '00

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section 2

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1. Find a basis for the image of the linear map with matrix $A = \begin{pmatrix} 1 & 2 & 4 & 3 \\ 2 & 4 & 9 & 7 \\ 3 & 6 & 13 & 10 \end{pmatrix}$

2. Find all matrices that commute with $A = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$.

3. Suppose A and B are $(n \times n)$-matrices with $AB = I_{n\times n}$, the $(n \times n)$-identity matrix. Find the nullspace of B.

Prof. S. Brick **Linear Algebra; Quiz 8** **Math 237**
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0. Print your name: ______________________________

1. Find the inverse, if it exists, of $\begin{pmatrix} 1 & 0 & 1 \\ 2 & 5 & 0 \\ 1 & 3 & 0 \end{pmatrix}$

2. Suppose A and B are invertible $(n \times n)$-matrices. Prove that AB is invertible.

3. Suppose A is an $(n \times n)$-matrix with $A^3 = 0_{n\times n}$. Prove that $B = I_{n\times n} - A$ is invertible with inverse $I_{n\times n} + A + A^2$.

Prof. S. Brick **Linear Algebra; Quiz 9** **Math 237**
Fall '00 **section 2**

0. Print your name: ______________________________

1. Let $\vec{v}_1 = (2,-1,-1,-1)$, $\vec{v}_2 = (1,3,3,-4)$, $\vec{v}_3 = (1,1,0,1)$, and $\vec{v}_4 = (1,-2,3,1)$. Prove that $\left\langle \vec{v}_1, \vec{v}_2, \vec{v}_3, \vec{v}_4 \right\rangle$ is orthogonal.

2. Find the inverse of $\begin{pmatrix} 2 & 1 & 1 & 1 \\ -1 & 3 & 1 & -2 \\ -1 & 3 & 0 & 3 \\ -1 & -4 & 1 & 1 \end{pmatrix}$ using the fact from problem #1 that the columns are orthogonal.

3. Find a matrix expression such as a product of matrices (note: do **not** multiply out the expression) for a linear transformation of 4-dimensional space which has eigenvalues π, $\sqrt{2}$, -278, and $\frac{3}{17}$ with corresponding eigenvectors $\vec{v}_1$, $\vec{v}_2$,$\vec{v}_3$, and $\vec{v}_4$.