HOMEWORK ASSIGNMENT

Name: **Due:** Wednesday March 20, 4PM

PROBLEM 1

1. What matrix M transforms $(1,0)$ and $(0,1)$ to (r,t) and (s,u)?

2. What matrix N transforms (a,c) and (b,d) to $(1,0)$ and $(0,1)$?

3. What condition on a, b, c, d will make part (b) impossible?

PROBLEM 2

1. Find an orthonormal basis (using Gram-Schmidt method) for the subspace S in $\mathbb{R}^4$ spanned by all solutions of

$$x_1 + x_2 + x_3 - x_4 = 0.$$

2. Find an orthonormal basis for the orthogonal complement $S^\perp$.

3. Find $\mathbf{b}_1$ in S and $\mathbf{b}_2$ in $S^\perp$ so that $\mathbf{b}_1 + \mathbf{b}_2 = (1,1,1,1)$.

4. Find the point in S closest to $(1,0,0,0)$.

PROBLEM 3

True or false, with a reason if true or a counterexample if false:

1. The determinant of $I + A$ is $1 + \det(A)$.

2. The determinant of ABC is $|A||B||C|$.

3. The determinant of $4A$ is $4|A|$.

4. The determinant of $AB - BA$ is zero. Try an example with $A = \begin{bmatrix} 0 & 0 \\ 0 & 1 \end{bmatrix}$.

PROBLEM 4

Compute the determinants of A, B, C, D. Are their columns independent?

$$A = \begin{bmatrix} 1 & 1 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 1 \end{bmatrix} \quad \text{and} \quad B = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix} \quad \text{and} \quad C = \begin{bmatrix} A & 0 \\ 0 & A \end{bmatrix} \quad \text{and} \quad D = \begin{bmatrix} A & 0 \\ 0 & B \end{bmatrix}.$$

Problem 6: Challenge Problems from the zyBook

Challenge activities 6.1.1, 6.2.1, and 6.3.1 of the zyBook. These are not optional.

Problem 7:

Read Chapter 7 from the zyBook and do all of the participation exercises therein. Which concept was most confusing for you?