MATH 2270

Quiz #5 - Fall 2008

DUE: In class Friday (10/31)

Name: ____

NOTES:

- Work individually, but feel free to use books, notes, etc.
- In order to receive full credit on a problem, you must clearly show each step used to obtain the solution.
- The quiz is due at (or before) the *beginning* of class on Friday 10/31. If you cannot attend class on Friday (or choose not to), drop your quiz off at my office (JWB 213) or put it in my mailbox (JWB 228) sometime *before* the start of class.
- I will post the solutions on the course webpage

  http://www.math.utah.edu/~crofts

  immediately following class on Friday. Consequently, I cannot accept late quizzes.

1. (3 points) Let

$$V = \text{span}\left\{ \begin{pmatrix} 1 \\ 1 \\ 1 \\ 1 \end{pmatrix}, \begin{pmatrix} 1 \\ 1 \\ -1 \\ -1 \end{pmatrix}, \begin{pmatrix} 1 \\ -1 \\ -1 \\ 1 \end{pmatrix} \right\}$$

be a subspace of $\mathbb{R}^4$ and suppose $\vec{v} = \begin{pmatrix} 1 \\ 0 \\ 0 \\ 0 \end{pmatrix}$. Then $\vec{v} = \vec{v}^{\|} + \vec{v}^{\perp}$ with respect to the subspace V. Find $\vec{v}^{\|}$ and $\vec{v}^{\perp}$.

2. (3 points) Find the QR factorization of the matrix

$$M = \begin{pmatrix} 6 & 2 \\ 3 & -6 \\ 2 & 3 \end{pmatrix}.$$

3. (2 points) Find the 3×3 matrix A of the orthogonal projection onto the line in $\mathbb{R}^3$ spanned by the vector $\begin{pmatrix} 1 \\ 2 \\ 2 \end{pmatrix}$.

4. (3 points) True/False. Indicate whether the following statements are true or false.

   (a) If the matrices A and B commute, then the matrices A^{T} and B^{T} also commute.

   (b) If A is a square matrix, then $\frac{1}{2}(A - A^{\mathrm{T}})$ is a skew-symmetric matrix.

   (c) There exists a subspace $V \subset \mathbb{R}^5$ such that $\dim(V) = \dim(V^{\perp})$.