Quiz 4 for Calculus ++, Math 2605A1-2, April 1, 2004

Name:

This quiz is to be taken without calculators and notes of any sorts. The allowed time is 25 minutes. Provide exact answers; not decimal approximations! For example, if you mean $\sqrt{2}$ do not write $1.414\ldots$.

I: Consider the matrix $A = \begin{bmatrix} 6 & 8 \\ -8 & 6 \end{bmatrix}$.

a) (2 points) Find the Householder reflection that maps the vector $\begin{bmatrix} 6 \\ -8 \end{bmatrix}$ to a multiple of $\mathbf{e_1}$.

b) (2 points) Find the QR decomposition of the matrix A.

II: (3 points) Compute e^{tA} where

$$A = \begin{bmatrix} 3 & 4 \\ 0 & 2 \end{bmatrix} .$$

III: (3 points) The Householder reflection that maps the vector $\begin{bmatrix} 1+i \\ 4 \end{bmatrix}$ to a multiple of $\mathbf{e_1}$ is of the form $\mathbf{I} - 2\mathbf{u}\mathbf{u}^*$. Find $\mathbf{u}$.

Extra credit: (3 points) Find the Schur factorization of the matrix in **Problem I**.