Math2605-C Quiz10

Name:

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1. Let $x = \begin{bmatrix} 2 \\ 2 \\ 1 \end{bmatrix}$ Find the Householder reflection matrix M such that Mx is a multiple of e_1.
   Solution:

   $y = 3 \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$

   $u = \frac{1}{\sqrt{6}} \begin{bmatrix} 1 \\ -2 \\ -2 \end{bmatrix}$

   $uu^t = \frac{1}{6} \begin{bmatrix} 1 & -1 & -1 \\ -2 & 4 & 2 \\ -1 & 2 & 2 \end{bmatrix}$

   $M = \frac{1}{3} \begin{bmatrix} 2 & 2 & 1 \\ 2 & -1 & -2 \\ 1 & -2 & 2 \end{bmatrix}$

2. Let $z = \begin{bmatrix} i \\ 2+2i \end{bmatrix}$ Compute the Householder reflection matrix M such that Mz is a multiple of e_1.(The multiple will have to be chosen so that it results in a vector w that is the same length as z, and such that $< z, w >$ is a real number.)

   Solution:

   $w = 3 \begin{bmatrix} i \\ 0 \end{bmatrix}$

   $u = \frac{1}{\sqrt{3}} \begin{bmatrix} i \\ -1-i \end{bmatrix}$

   $uu* = \frac{1}{3} \begin{bmatrix} 1 & -1-i \\ -1+i & 2 \end{bmatrix}$

   $M = \frac{1}{3} \begin{bmatrix} 1 & 2+2i \\ 2-2i & -1 \end{bmatrix}$