

Homework 7

(due Friday, October 31, 2008)

Problem 1: If Q_1 and Q_2 are $n \times n$ orthogonal matrices, show that the product Q_1Q_2 is also an orthogonal matrix. If $n = 2$, Q_1 represents rotation through θ , and Q_2 represents rotation through ϕ , what does Q_1Q_2 represent and why? *If you have difficulty to show the first statement for the general case, consider $n = 2$.*

Problem 2: Show that an orthogonal matrix that is upper triangular must be diagonal.

Problem 3: Find an orthonormal set of vectors q^1, q^2, q^3 for which q^1, q^2 span the column space of

$$A = \begin{bmatrix} 1 & 1 \\ 2 & -1 \\ -2 & 4 \end{bmatrix}.$$

Which fundamental subspace contains q^3 ? What is the least squares solution of $Ax = b$ if

$$b = \begin{bmatrix} 1 \\ 2 \\ 7 \end{bmatrix}?$$