

Math 430 Fall 2016 Homework #10

Due Nov. 15, Tue in class

1. Textbook, Section 5.6, page 235: 3(a,b), 4(a), 5;
2. Textbook, Section 5.9, page 390: 3, 4, 5;
3. Let P be an $n \times n$ orthogonal matrix.
 - (1) Show that $\langle x, y \rangle = \langle Px, Py \rangle$ for any $x, y \in \mathbb{R}^n$, where $\langle \cdot, \cdot \rangle$ is the standard inner product for \mathbb{R}^n .
 - (2) Show that $x, y \in \mathbb{R}^n$ are orthogonal if and only if Px, Py are orthogonal.
4. Let u, v, w, z be four vectors in \mathbb{R}^4 such that they span \mathbb{R}^4 . Let the subspaces $\mathcal{X} = \text{span}\{u, v\}$ and $\mathcal{Y} = \text{span}\{w, z\}$.
 - (1) Show that $\{u, v, w, z\}$ is linearly independent and $\mathbb{R}^4 = \mathcal{X} \oplus \mathcal{Y}$.
 - (2) Let $x = u - v + 2w - 3z$. Find the projection of x onto \mathcal{X} (along \mathcal{Y}), and the projection of x onto \mathcal{Y} (along \mathcal{X}).