Homework 7–21-241 Lec5, Matrices and Linear Transformations

Name: ____________________
Section: ____________________

Instructions: Complete the following problems, clearly labeling the problems. Staple this sheet, with your name and section filled in, to the top of your work. Failure to attach this sheet will result in a one point deduction in the grade. The assignment will be graded out of ten points.

DUE: Friday, November 6, 2015

Book Problems

- Section 5.2: 4, 12, 20, 24
- Section 5.3: 6, 14, 20
- Section 5.4: 8, 14, 20, 22

Other Problems

1. Let $S = \{\mathbf{u}_1, \mathbf{u}_2, \ldots, \mathbf{u}_n\}$ be an orthonormal basis for $\mathbb{R}^n$. Let $\mathbf{v} = \sum_{i=1}^{n} a_i \mathbf{u}_i$ and $\mathbf{w} = \sum_{i=1}^{n} b_i \mathbf{u}_i$ where $a_i, b_i \in \mathbb{R}$ for $i = 1, \ldots, n$. Show that $\mathbf{v} \cdot \mathbf{w} = \sum_{i=1}^{n} a_i b_i$.
2. Let W be a subspace of $\mathbb{R}^n$, and let $\mathbf{v} \in \mathbb{R}^n$. Show that $\|\mathbf{v} - \mathbf{w}\|$, where $\mathbf{w} \in W$, is minimized when $\mathbf{w} = \mathrm{proj}_W(\mathbf{v})$. (This shows that $\|\mathrm{perp}_W(\mathbf{v})\|$ can be seen as the distance from $\mathbf{v}$ to W.)