Math 518: HW 7 due Wednesday, October 22, 2014.

1. Problem 8-26 of Lee on page 203.

2. Problem 8-28 of Lee on page 203.

3. Problem 20-5 on page 536.

4. Problem 20-4 on page 536.

5. (a) Combine Problems 1 and 2 to show that the Lie algebra of $\mathrm{SL}_n\mathbb{R}$ is the subset of $M_n(\mathbb{R})$ consisting of matrices of trace 0.

   (b) Explain how the result in (a) is consistient with your answer to Problem 4.

6. Let V be a $\mathbb{R}$-vector space with basis $\{e_1, e_2, ..., e_m\}$ and consider the dual basis $\{\alpha^1, \alpha^2, \ldots, \alpha^m\}$ of V^*. Let W be another $\mathbb{R}$-vector space with basis $\{f_1, f_2, ..., f_n\}$ and dual basis $\{\beta^1, \beta^2, \ldots, \beta^n\}$ for W^*. Suppose $T\colon V \to W$ is a linear transformation. Let A be the matrix of T and let A^* be the matrix of $T^*\colon W^* \to V^*$ with respect to our choosen bases. Prove that A^* is just the transpose of A.

7. Problem 11-1 of Lee on page 299.