Homework assignment, Nov. 2, 2007.

1. Find the tangent space at I to the set $SL(n)$ of all $n \times n$ matrices with determinant 1

2. Find the tangent space at I to the set $O(n)$ of orthogonal matrices.

Hint: You have proved in the previous assignment that both sets are manifolds in the space $M_{n\times n}$ of all $n \times n$ matrices. If you computed correctly the differentials of the defining equations, both problems are almost trivial.

3. Is the set $O(n)$ of all orthogonal matrices connected or disconnected? **Hint:** recall, that the determinant of an orthogonal is either 1 or -1.