Homework assignment, Oct. 19, 2007.

1. Let $M_{n \times n}$ be the set of $n \times n$ matrices, and let GL_n be the set of all invertible $n \times n$ matrices. Compute differentials of the following functions.

- a) $f: M_{n \times n} \to M_{n \times n}, f(X) = X^3;$
- b) $f: GL_n \to M_{n \times n}, \ f(X) = X^{-1};$
- c) $f: GL_n \to \mathbb{R}, f(X) = \det X$

Try to write the answer in the invariant form, i.e. try to describe what is the linear transformation $df_{\mathbf{x}}$ doing without writing its matrix.