HW 2

1. Let $F : \mathbb{R}^n \to \mathbb{R}$ be a homogeneous function of order k, i.e., $F(\lambda x) = \lambda^k F(x)$ for all $\lambda \in (0, \infty)$. Then prove Euler's identity: $x_1 F_{x_1} + x_2 F_{x_2} + \ldots + x_n F_{x_n} = kF$.

2. Let $F : Mat_{n\times n} \to Mat_{n\times n}$ be defined as $F(A) = A^3$. Prove that F is differentiable and compute its derivative.

3. Let a be an interior point of $U \subset \mathbb{R}^m$ and let $f : U \to \mathbb{R}$ be a function. If the partials $D_i f$ exist and are bounded in a neighbourhood of a, show that f is continuous at a.