Math 896-503 **Assignment # 3** **10 June 09**

Due: June 11th

1. Consider the function $F : \mathbb{R}^3 \to \mathbb{R}$ given by $F(x, y, z) = x^2 + y^2 + z^2$.

   (a) Find the differential of F at $a = (3, 2, 6)$, dF_a, which is a linear transformation from $\mathbb{R}^3$ to $\mathbb{R}^3$.

   (b) Using the differential, find an approximate value for $3.02^2 + 1.97^2 + 5.98^2$.

2. Suppose that $F : \mathbb{R}^n \to \mathbb{R}^m$ and $G : \mathbb{R}^n \to \mathbb{R}^k$ are both differentiable at $a \in \mathbb{R}^n$. If $H : \mathbb{R}^n \to \mathbb{R}^{m+k}$ is given by $H(x) = (F(x), G(x))$ then show directly from the definition that H is differentiable at a.