Q3:
We first claim that $f(0) = 0$.

$$\begin{aligned}
&\|f(0)\| \leq \|0\|^2 \\
&\implies \|f(0)\| \leq 0 \\
&\implies \|f(0)\| = 0 \\
&\implies f(0) = 0
\end{aligned}$$

We not show that $f \in o(h)$ Now consider $f(h)$ for some $h \in \mathbb{R}^n$.

$$\begin{aligned}
&\|f(h)\| \leq \|h\|^2 \\
&\implies \frac{\|f(h)\|}{\|h\|} \leq \|h\| \\
&\implies \lim_{h \to 0} \frac{\|f(h)\|}{\|h\|} \leq \lim_{h \to 0} \|h\| \\
&\implies \lim_{h \to 0} \frac{\|f(h)\|}{\|h\|} = 0
\end{aligned}$$

Thus we can write $f(h) = f(0) + Lh + o(h)$ for some linear mapping L. Since $f \in o(h)$, this implies that $L \in o(h)$. By the lemma from class any linear mapping in $o(h)$ is 0. And so f is differentiable with $Df(0) = 0$.