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If $f : \mathbb{R} \rightarrow \mathbb{R}^m$ is twice differentiable, then argue that

$$\| [f(0) + f'(0)s] - f(s) \|_2 \leq \frac{s^2}{2} \left(\max_{0 \leq \xi \leq s} \|f''(\xi)\|_2 \right).$$

You may want to use the fact that in general $\|v\| = \max_{\|u^*\|=1} u^*v$.