$$\nabla^T f(t)\,(s-t)^T\,\nabla^2 f(t)$$

$$= \left(\nabla^T f(t) \left(\sum (s_i - t_i)\, \nabla^2 f(t)_{:i} \right) \right)_{jk}$$

$$= \frac{\partial f}{\partial t_j} \left(\sum_{k,i} (s_i - t_i)\, \nabla^2 f(t)_{ik} \right)$$

$$= \frac{\partial f(t)}{\partial t_j} \sum (s_i - t_i) \frac{\partial^2 f(t)}{\partial t_i \partial t_k}.$$

$$\mathbb{E}\left[\frac{\partial f}{\partial t_i}(t)^2 \right] = 1.$$

$$\Rightarrow \frac{\partial}{\partial t_j} \mathbb{E}\left[\frac{\partial f}{\partial t_i}(t)^2 \right] = 0$$

$$= \mathbb{E}\left[2 \frac{\partial f}{\partial t_i \partial t_j}(t) \frac{\partial f}{\partial t_i}(t) \right] = 0 \; !$$

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differentiating again gives $\rightarrow$ $\mathbb{E}\left[2 \frac{\partial f}{\partial t_i \partial t_j \partial t_k}(t) \right]$