

$$\mathbb{E}[X(t)^2] = \sigma^2$$

$$\Rightarrow \mathbb{E}[X(t) \nabla X(t)] = 0$$

$$\Rightarrow \mathbb{E}[X(t) \nabla^T X(t)] = 0$$

$$\Rightarrow \underbrace{\mathbb{E}[\nabla^T X(t) X(t)]}_{= \text{cov}(\nabla^T X(t))} \downarrow \text{using the vector product rule}$$

$$\mathbb{E}[\nabla^T X(t) \nabla X(t)] = \mathbb{E}[X(t) \nabla(\nabla^T X(t))]$$

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