1st Term: taking $\mathbb{E}$ inside, have,

$$\cancel{\int_T \int_T} \int_T \mathbb{E}\Big[\delta_\varepsilon(\nabla X(t)) \sum_{\sigma \in S_n} \Big(\prod_{i=1}^{n} \left| \nabla^2 X(\tau)_{i\sigma(i)} \right| \Big) \times \mathbb{1}\Big[\Big| \frac{\nabla^2 X(\tau)}{X(\tau)} + \frac{\Lambda(\tau)}{\sigma^2} \Big| > \varepsilon \Big] \times \mathbb{1}[X(\tau) > v] \Big] dt$$

$$= \int_{B_r \subset T} \int_{\underset{\nabla X(t)}{\mathbb{R}^N} \times \underset{\nabla^2 X(\tau)}{\mathbb{R}^{\frac{N(N+1)}{2}}} \times \underset{X(\tau)}{\mathbb{R}}} \delta_\varepsilon(x) \sum_{\sigma} \prod \nabla^2 \cdots \times \mathbb{1}[X(\tau) > v] \cdots$$

$$\times \; p_{\nabla X(t), \nabla^2 X(\tau), X(\tau)}(x, y, z) \, dt$$

$$= \int_{B_r} dt \int_{\mathbb{R}^{\frac{N(N+1)}{2}} \times \mathbb{R}} \sum_{\sigma \in S_n} \prod \left| y_{i\sigma(i)} \right| \times \mathbb{1}\Big[\Big| \frac{y}{z} + \frac{\Lambda(\tau)}{\sigma^2} \Big| > \varepsilon \Big] \times \mathbb{1}[z > v]$$

$$\times \; p_{\nabla^2 X(\tau), X(\tau)}(y, z)$$

$$\times \underbrace{\int_{\mathbb{R}^N} \delta_\varepsilon(x) \, p_{\nabla X(t) \mid \nabla^2 X(\tau), X(\tau)}(x \mid y, z)}_{\text{this is cts as all is Gaussian}}$$

so by LCT.

$$\longrightarrow p_{\nabla X(t) \mid \nabla^2 X(\tau), X(\tau)}(0 \mid y, z)$$