Title: String Theory Course Q&A

Speakers:

Collection/Series: String Theory Course

Date: May 15, 2025 - 9:00 AM

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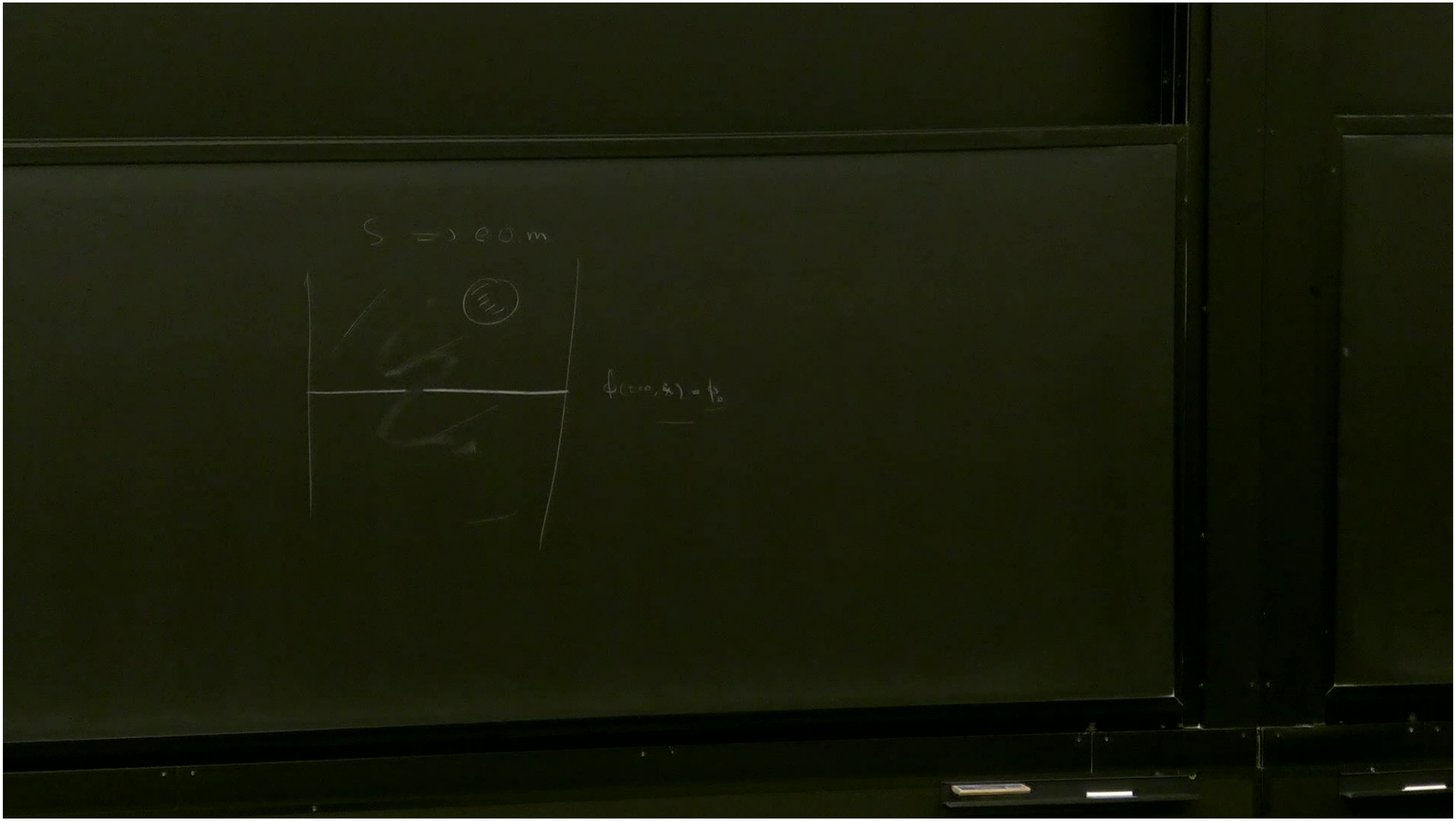
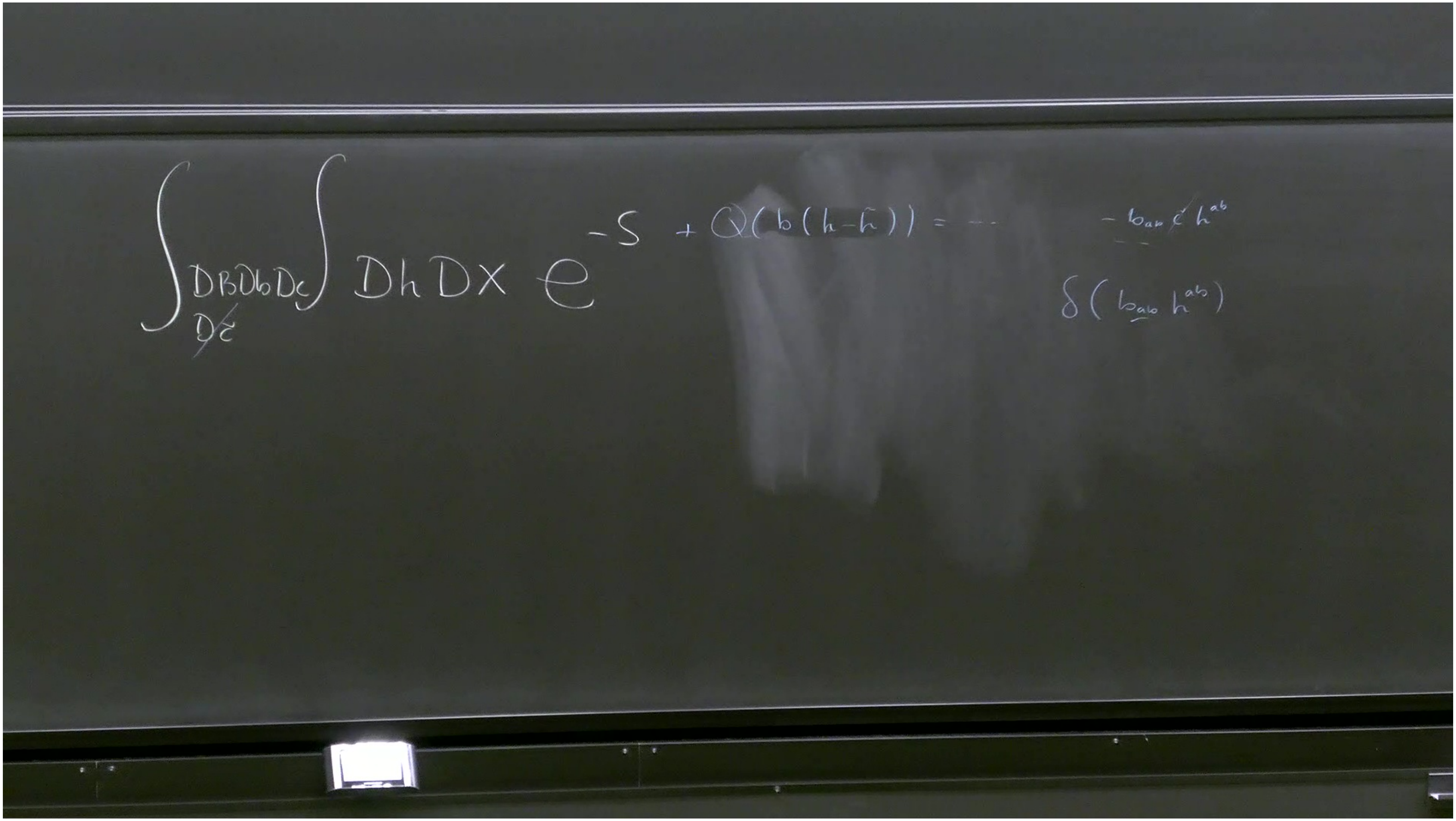


S ⟹ e.o.m
φ(t=0, x) = φ₀

$$Qh = \mathcal{L}_c h + \tilde{c} h$$

$$\int D\tilde{c}\, DB\, Db\, Dc \int Dh\, DX\, e^{-S}$$



$\int_{\cancel{Dc}} DB\,Db\,Dc \int Dh\,DX\; e^{-S + Q(b(h-\tilde{h}))} = \cdots$
$- b_{ab}\, \cancel{c}\, h^{ab}$
$\delta(b_{ab}\, h^{ab})$

$$S_0 + Q(b(h-\hat{h})) = S_0\Big|_{h=\hat{h}} - \cancel{\int \beta(h-\hat{h})} - b_{ab}\, c\, h^{ab} - b_{ab} \nabla^a c^b$$

$$\delta(b_{ab}\, h^{ab})$$

$$S_{gf} - \int \sqrt{\hat{h}}\, \hat{h}^{ab}\, \partial_a X^\mu \partial_b X^\nu \eta_{\mu\nu} + \int b_{ab} \nabla^a c^b$$

$$Qh = \underbrace{\mathcal{L}_c h}_{2\nabla_{(a} c_{b)}} + \tilde{c} h$$

$$Q b_{ab} = B_{ab} = \frac{\delta S_{gf}}{\delta h^{ab}} = T_{ab}$$

$$\int \cancel{D}B\, Db\, Dc\, \cancel{D}\tilde{c} \int \cancel{D}h\, DX$$

$$QB = 0$$

$$\boxed{Q b_{ab} = T_{ab}}$$

$$T_{ab} = 0$$

$$Q\,\mathcal{O} = 0$$

$$\mathcal{O} = \tilde{\mathcal{O}} + Q\tilde{\tilde{\mathcal{O}}} :\Longleftrightarrow \mathcal{O} \sim \tilde{\mathcal{O}}$$

$$T = 0 + Qb \implies T \sim 0$$

$$S_\circ + \int Q\left(b\,(h - \tilde{h})\right) = S_\circ \Big| + \int B(h - \tilde{h}) - b_{ab}\, \tilde{c}\, h^{ab} - b_{ab} \nabla^a c^b$$

$$\delta\left(b_{ab}\, h^{ab}\right)$$

$$S_{gf} = \int \sqrt{\tilde{h}}\, \tilde{h}^{ab}\, \partial_a X^\mu \partial_b X^\nu \eta_{\mu\nu} + \int b_{ab} \nabla^a c^b \sqrt{\tilde{h}}$$

$$P_a = [Q, G_a]$$

$$\text{if } \quad Q\mathcal{O} = 0 \Rightarrow \qquad \mathcal{O}(x+\varepsilon) \simeq \mathcal{O}(x) + \varepsilon^a \partial_a \mathcal{O}(x)$$

$$\varepsilon^a \left[P_a, \mathcal{O}(x)\right] = \varepsilon^a \left(\left[Q, G_a\right], \mathcal{O}(x)\right]$$

$$\left[Q, \left[G_a, \mathcal{O}(x)\right]\right]$$

$$\int Q\left(b\,(h-\tilde{h})\right) = S_0\Big| - \int B(h-\tilde{h}) - b_{ab}\, c\, h^{ab} - b_{ab}\nabla^a c^b$$

$$\delta\left(b_{ab}\, h^{ab}\right)$$

$$S_{gf} = \int \sqrt{h}\, h^{ab}\, \partial_a X^\mu \partial_b X^\nu \eta_{\mu\nu} + \int b_{ab}\nabla^a c^b \sqrt{\tilde{h}}$$

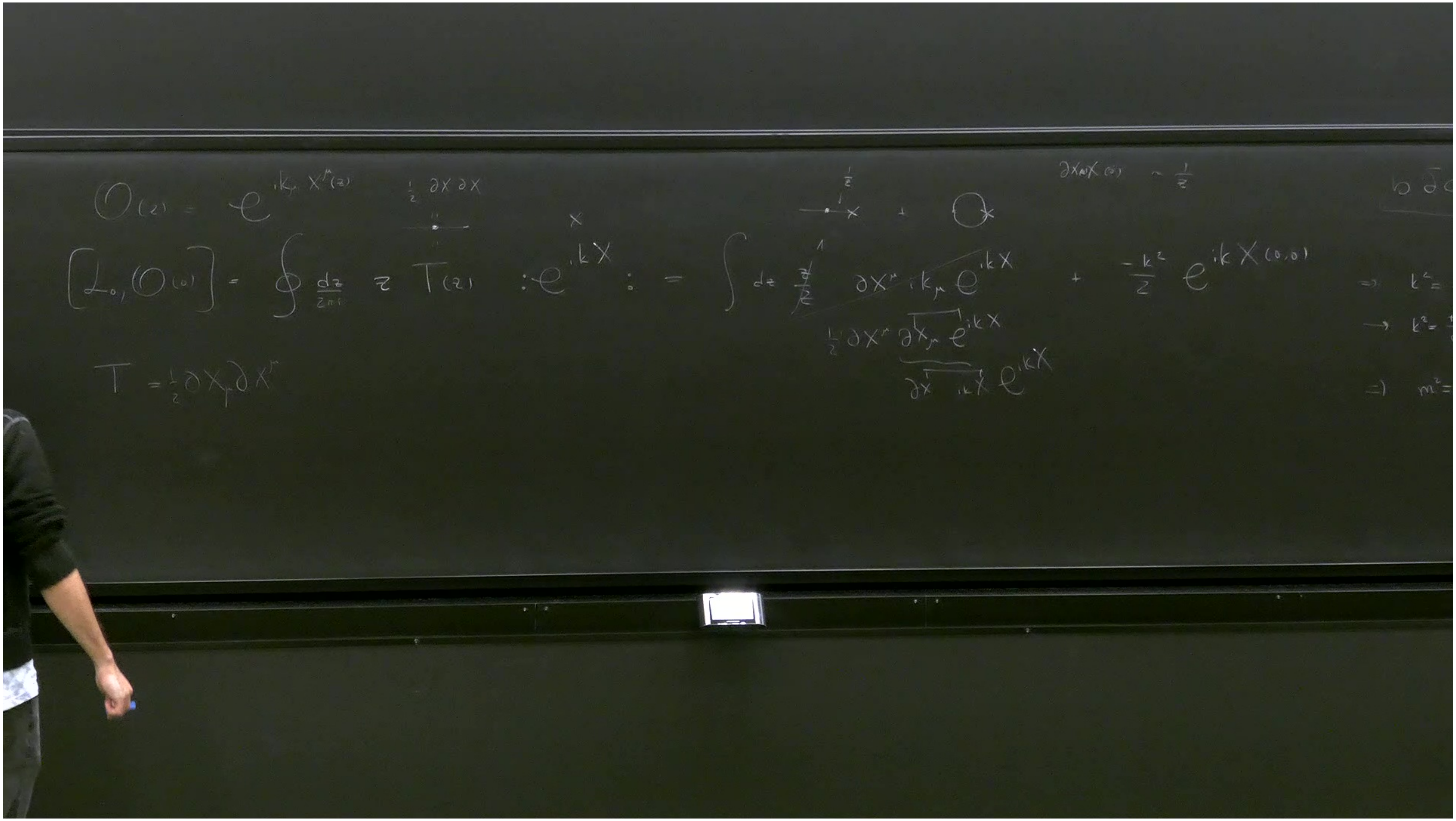
$$_a = [Q, G_a]$$

$$QO = 0 \Rightarrow$$

$$O(x+\varepsilon) \simeq O(x) + \varepsilon^a \partial_a O(x)$$

$$\varepsilon^a [P_a, O(x)] = \varepsilon^a \left([Q, G_a], O(x)\right]$$

$$[Q, [G_a, O(x)]]$$


O(z) = e^{ik_μ X^μ(z)}
1/2 ∂X ∂X
[L_0, O(0)] = ∮ dz/2πi z T(z) :e^{ikX}: = ∫ dz
∂X^μ ik_μ e^{ikX}
−k²/2 e^{ikX(0,0)}
1/2 ∂X^μ ∂X_μ e^{ikX}
∂X ikX e^{ikX}
T = 1/2 ∂X_μ ∂X^μ
∂X∂X(0) ~ 1/z