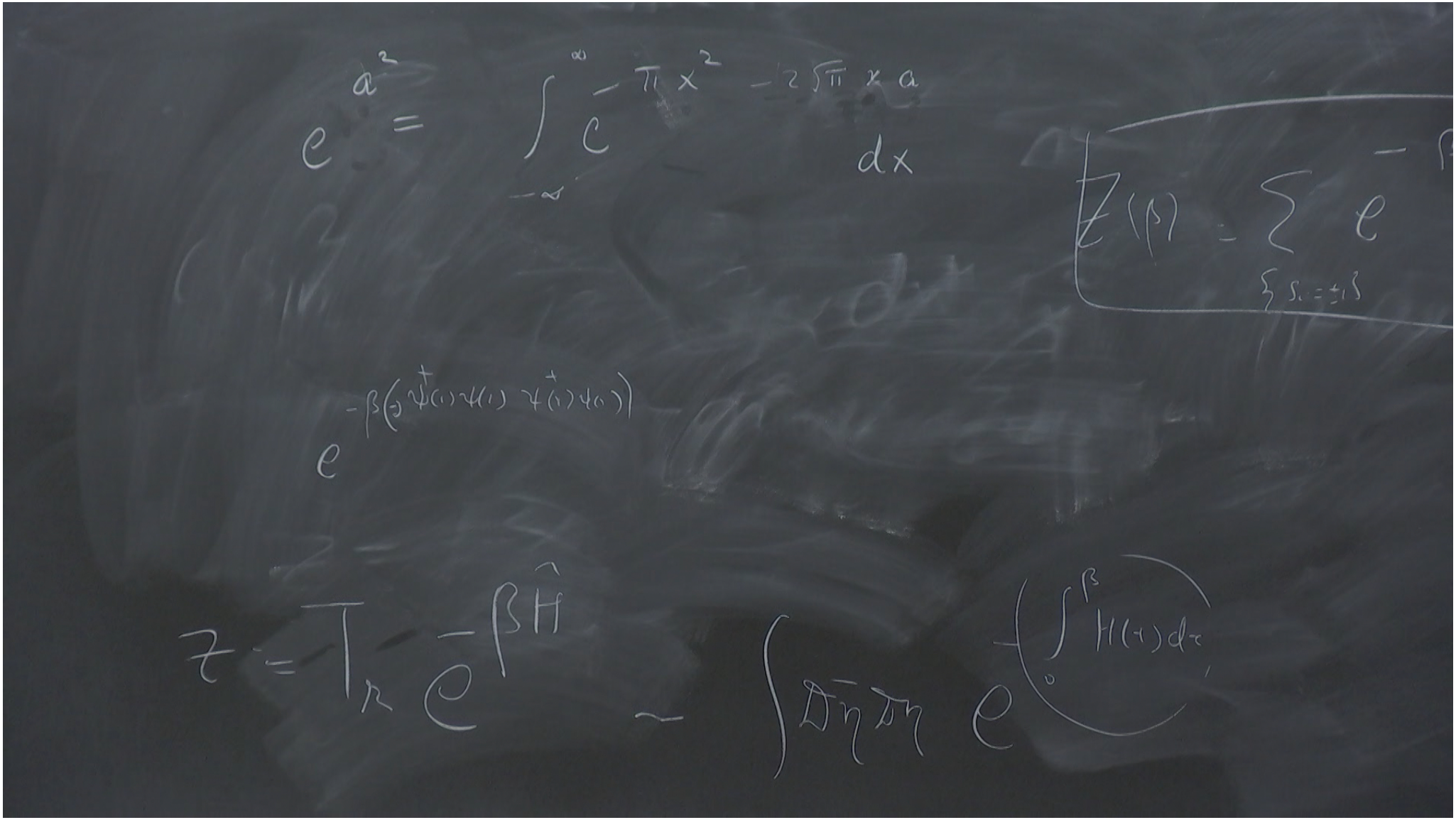
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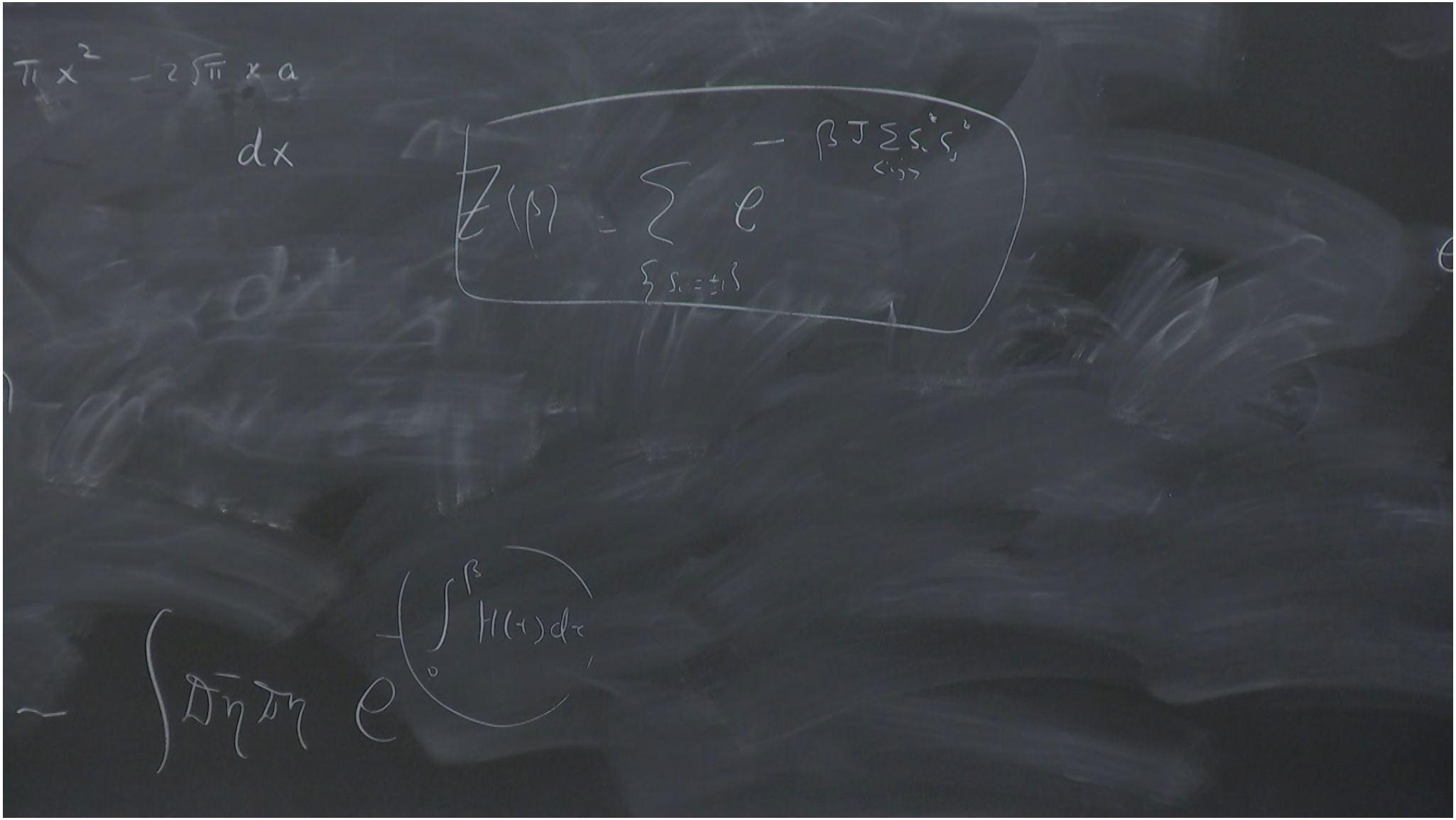
Speakers: Ganapathy Baskaran

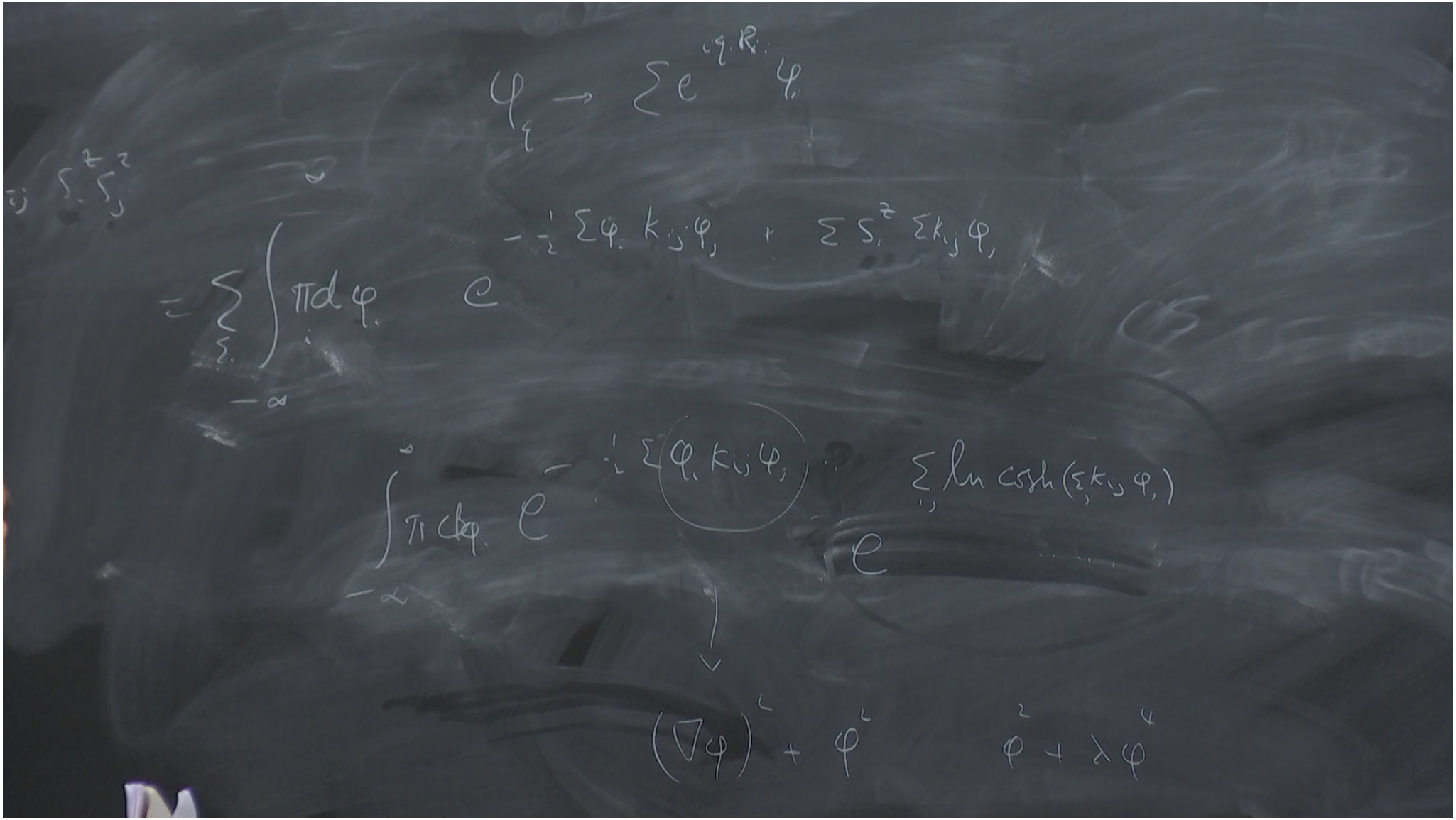
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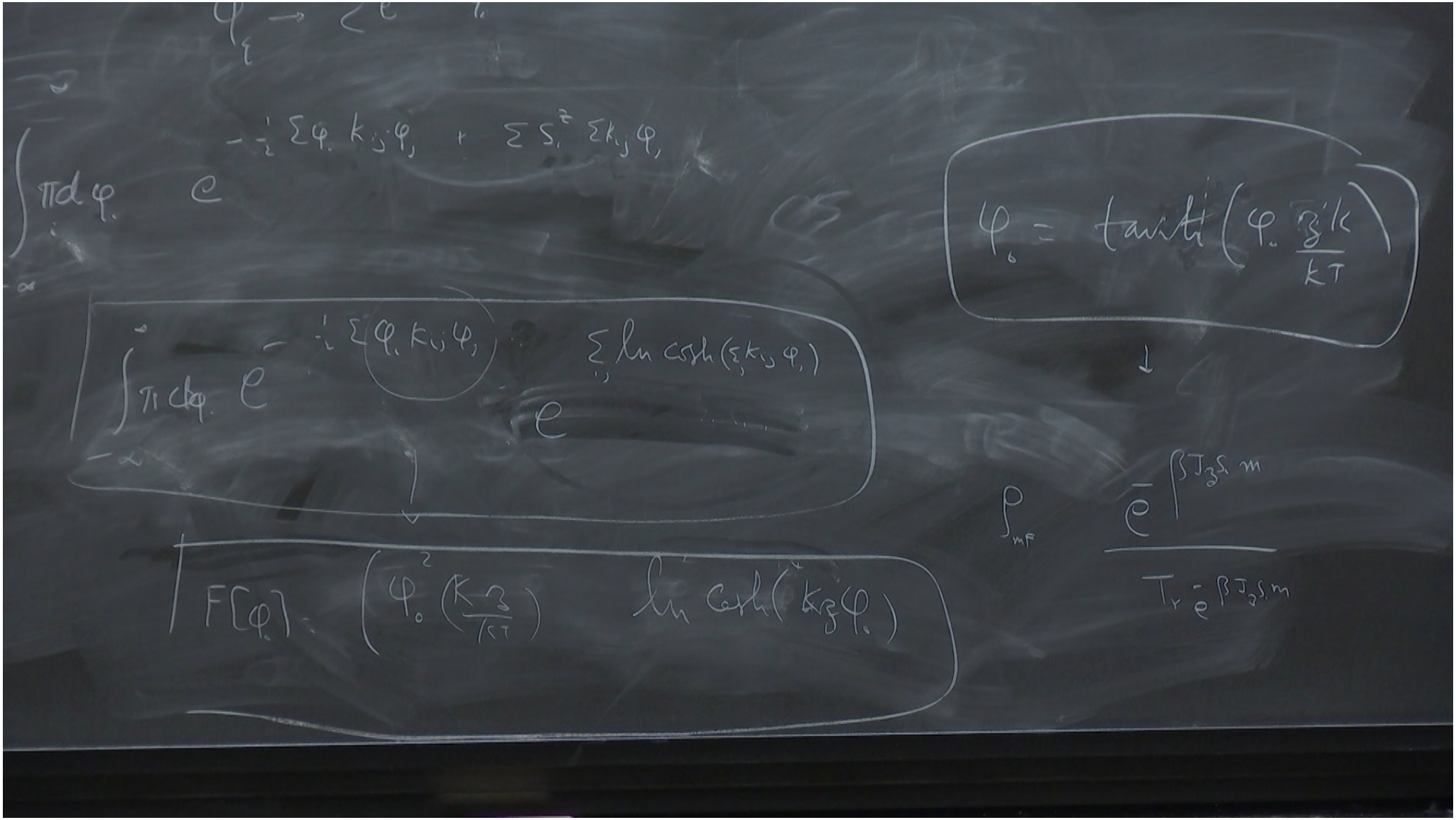
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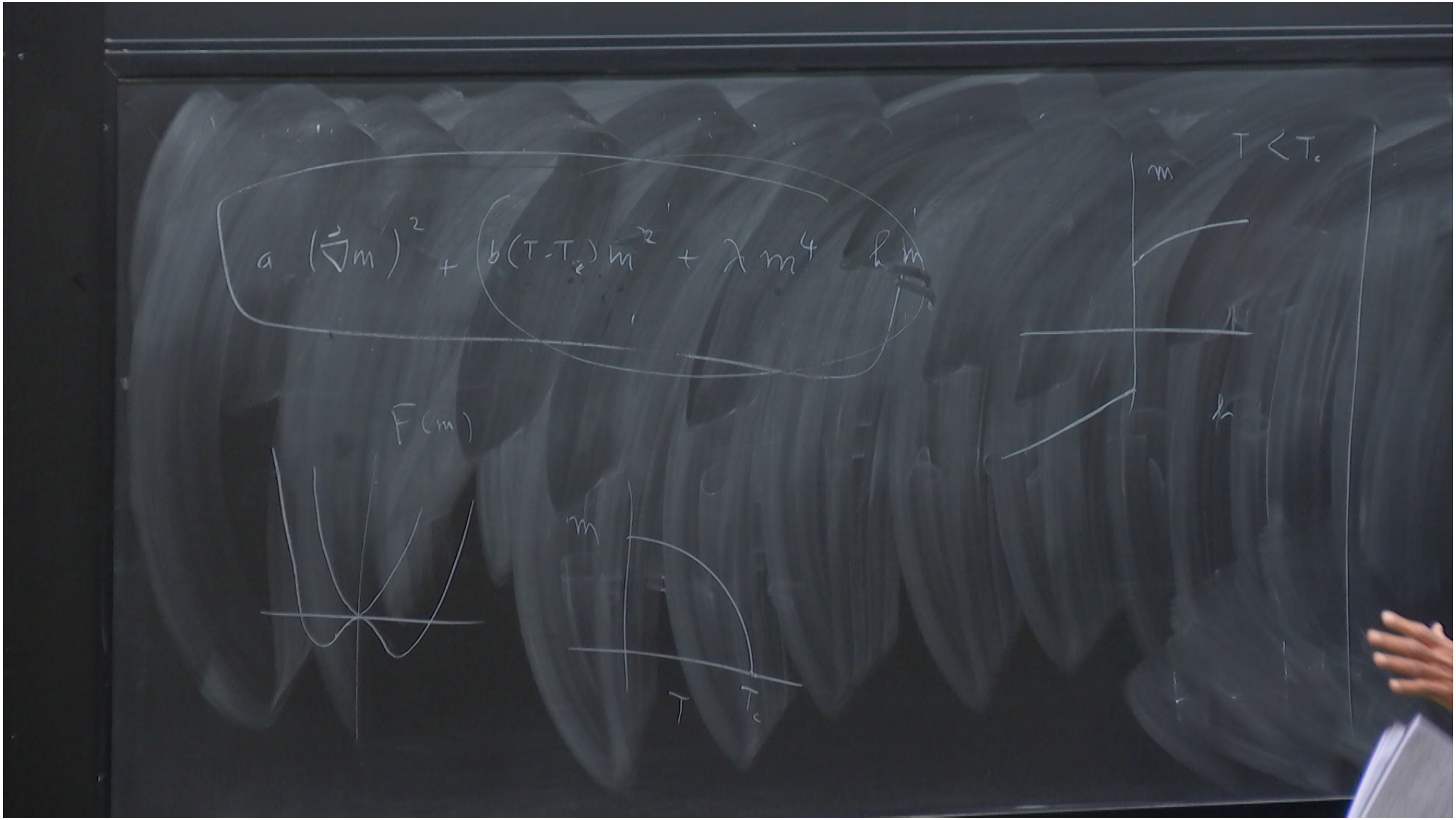
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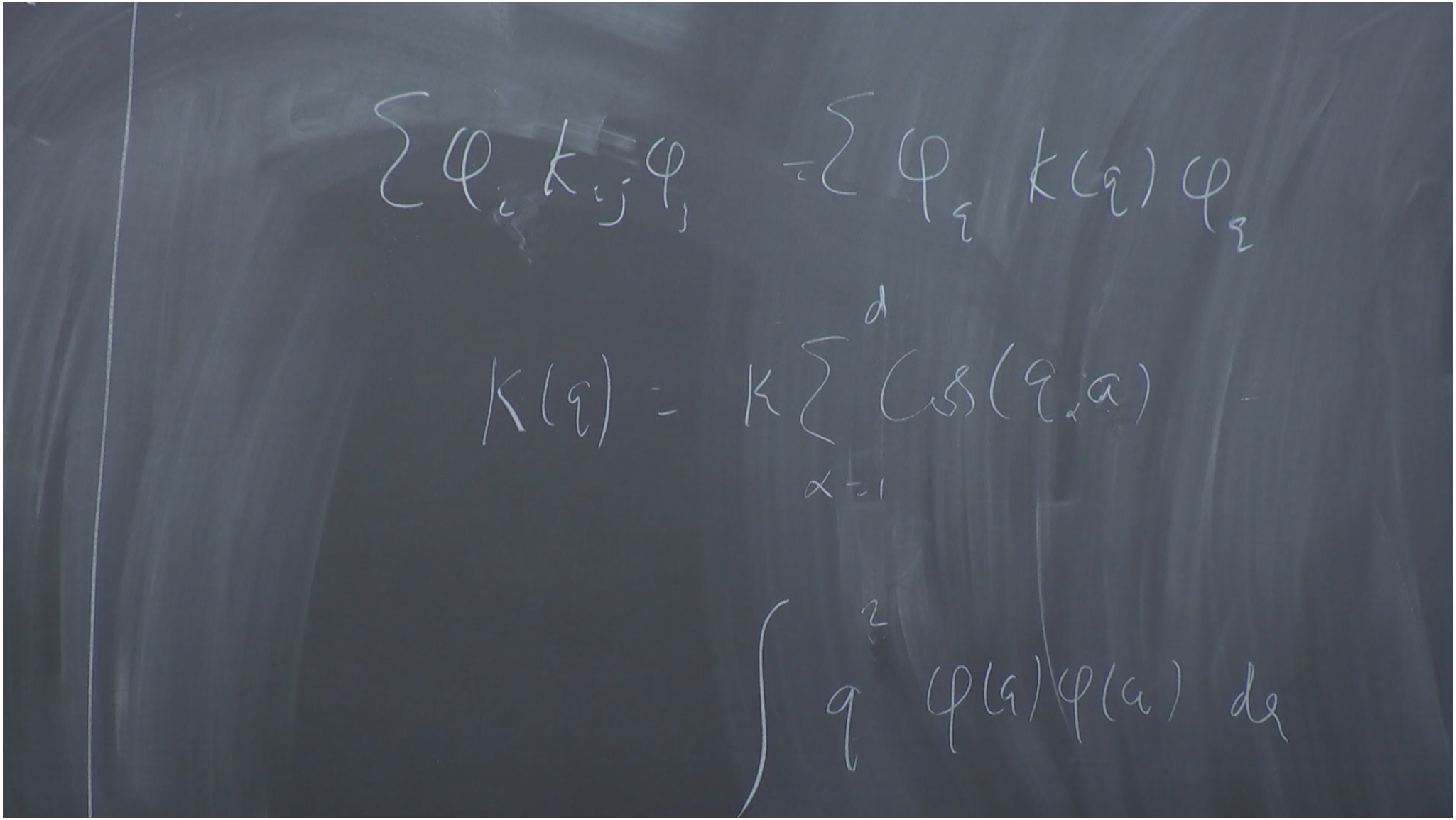

$e^{a^2} = \int_{-\infty}^{\infty} e^{-\pi x^2 - 2\sqrt{\pi} x a} dx$
$Z(\beta) = \sum_{\{s_i = \pm 1\}} e^{-}$
$e^{-\beta(\ldots \psi^\dagger(\tau)\psi(\tau)\ \chi^\dagger(\tau)\psi(\tau))}$
$Z = \mathrm{Tr}\, e^{-\beta \hat{H}} \sim \int \mathcal{D}\bar{\eta}\eta\, e^{-\int_0^\beta H(\tau) d\tau}$

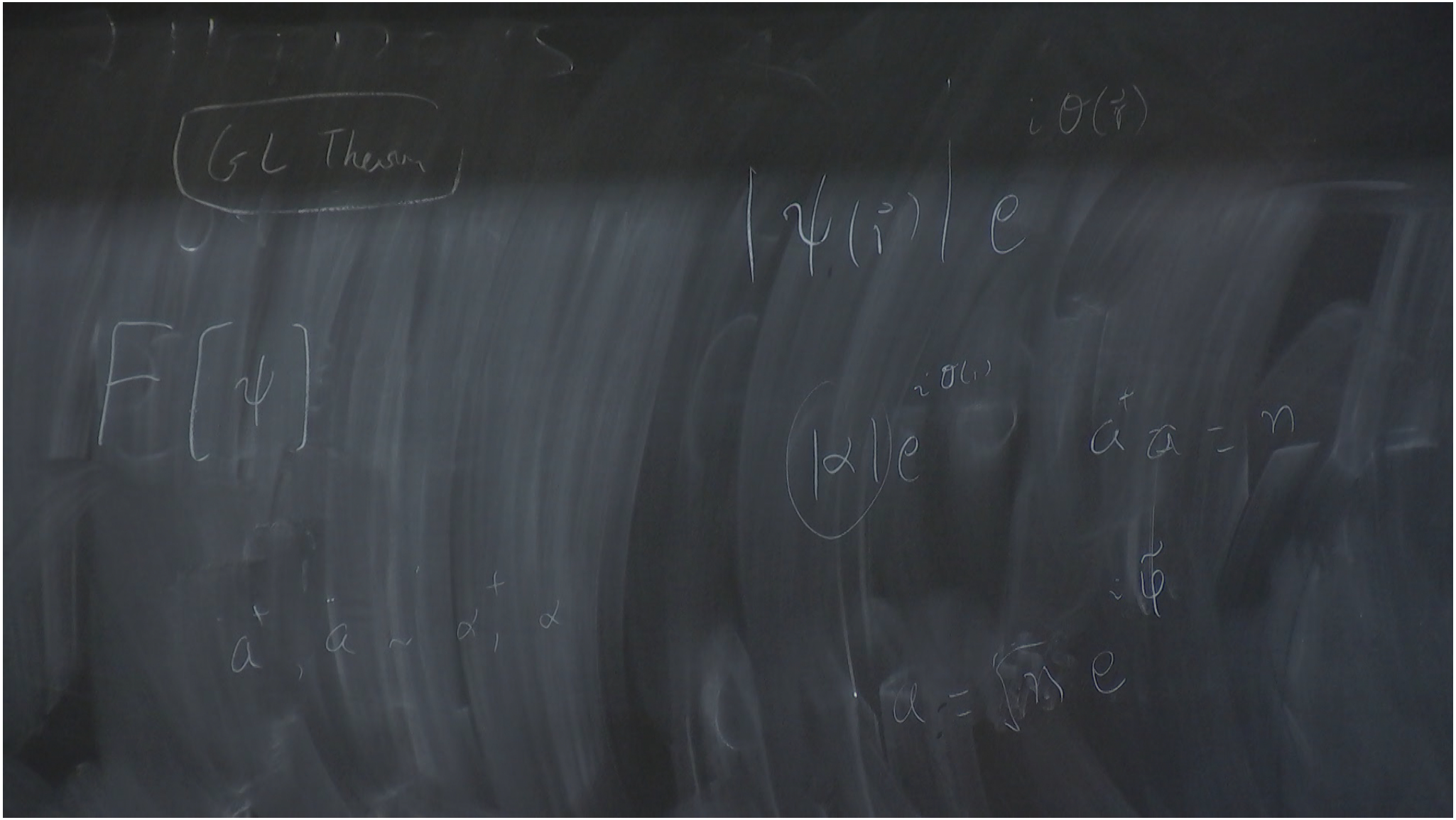

$\pi x^2 - 2\sqrt{\pi} x a$
dx
$Z(\beta) = \sum_{\{S_i = \pm 1\}} e^{-\beta J \sum_{\langle ij \rangle} S_i S_j}$
$\int \mathcal{D}\eta\mathcal{D}\pi\, e^{-\int_0^\beta H(\tau) d\tau}$

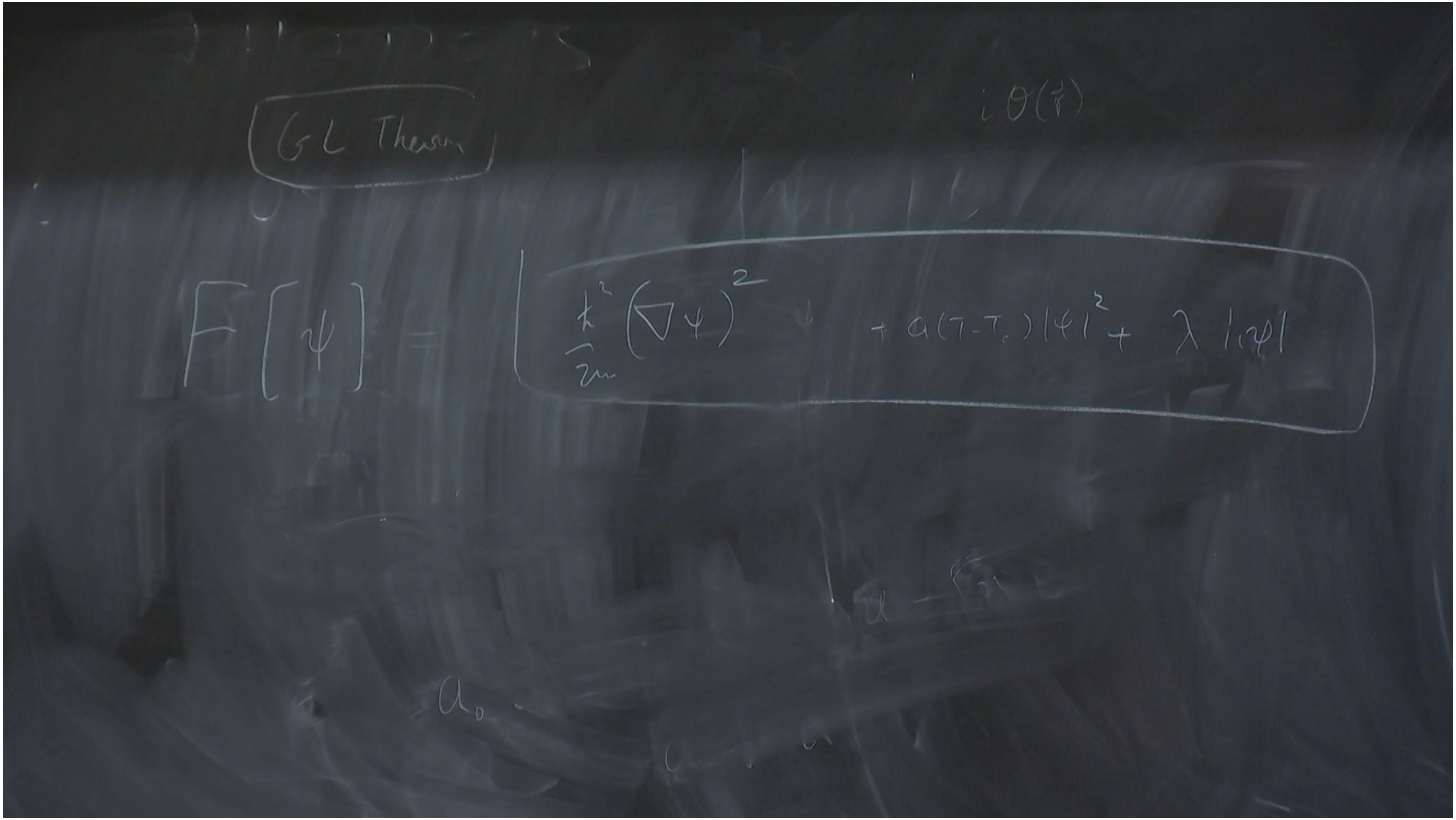


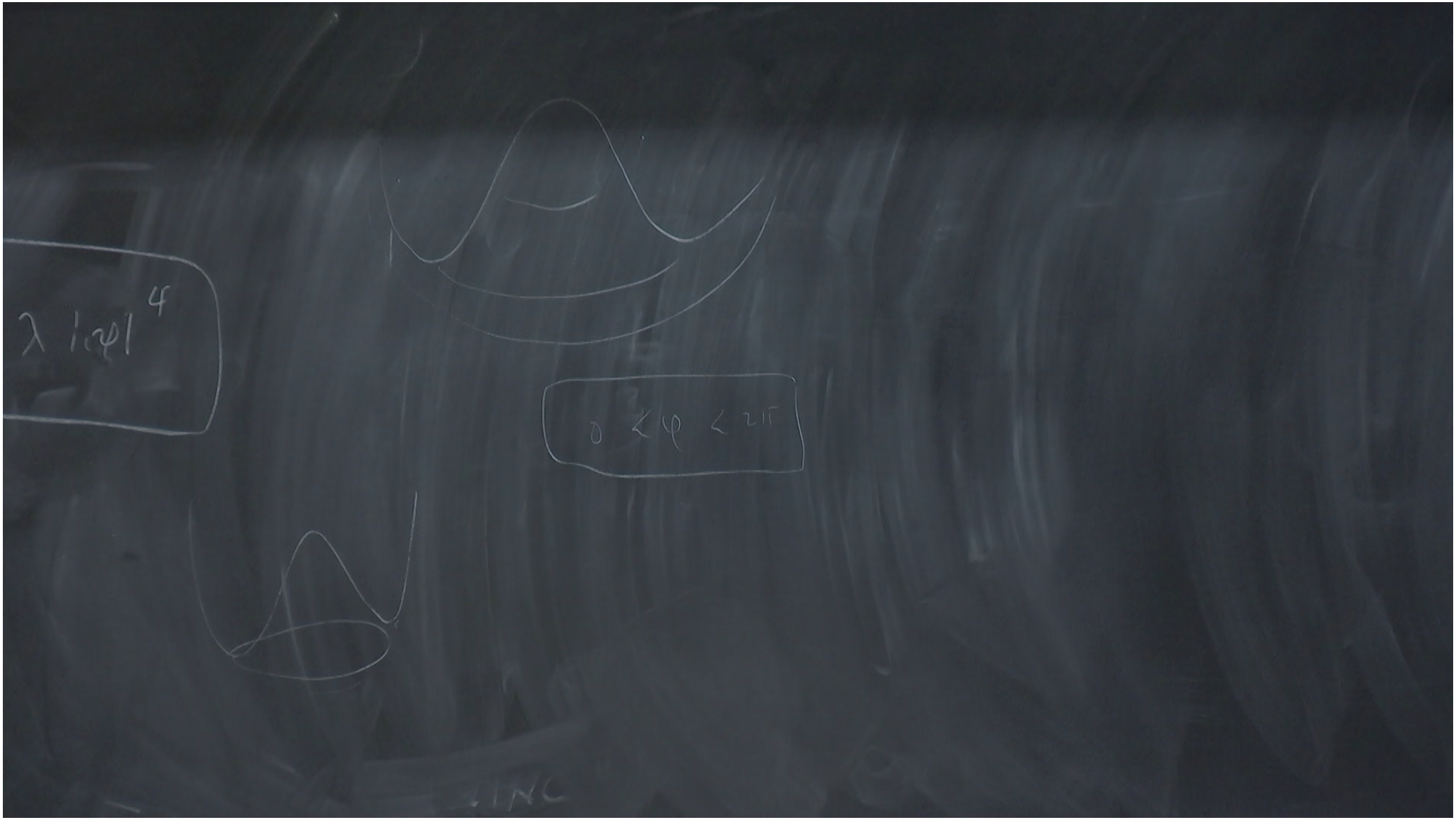

$\varphi_i \to$
$\int \pi d\varphi_i \; e^{-\frac{1}{2}\sum \varphi_i k_{ij} \varphi_j + \sum S_i^z \sum k_{ij} \varphi_j}$
$\varphi_0 = \tanh\left(\varphi_0 \frac{3 k}{kT}\right)$
$\int \pi_i d\varphi_i \; e^{-\frac{1}{2}\sum \varphi_i k_{ij} \varphi_j} \; e^{\sum_i \ln \cosh(\sum_j k_{ij} \varphi_i)}$
$F[\varphi_i] = \left(\varphi_0^2 \left(\frac{K-3}{kT}\right) \ln \cosh(k_3 \varphi_0)\right.$
$\rho_{mF} \quad \frac{e^{-\beta J_3 S_z m}}{T_r e^{-\beta J_3 S_z m}}$

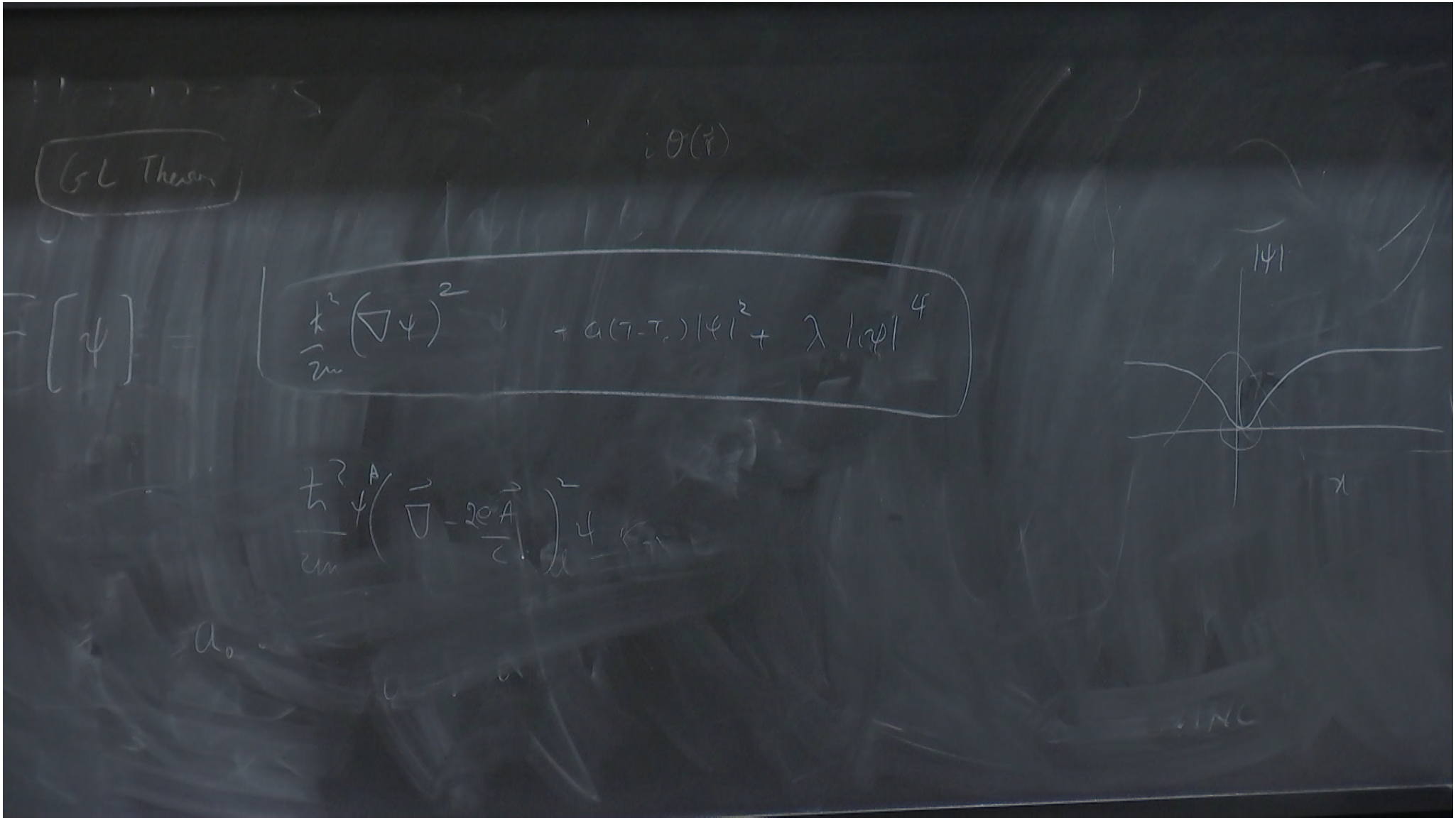

$a(\vec{\nabla}m)^2 + b(T-T_c)m^2 + \lambda m^4 \quad \& m$
$T < T_c$
m
h
$F(m)$
m
T
T_c

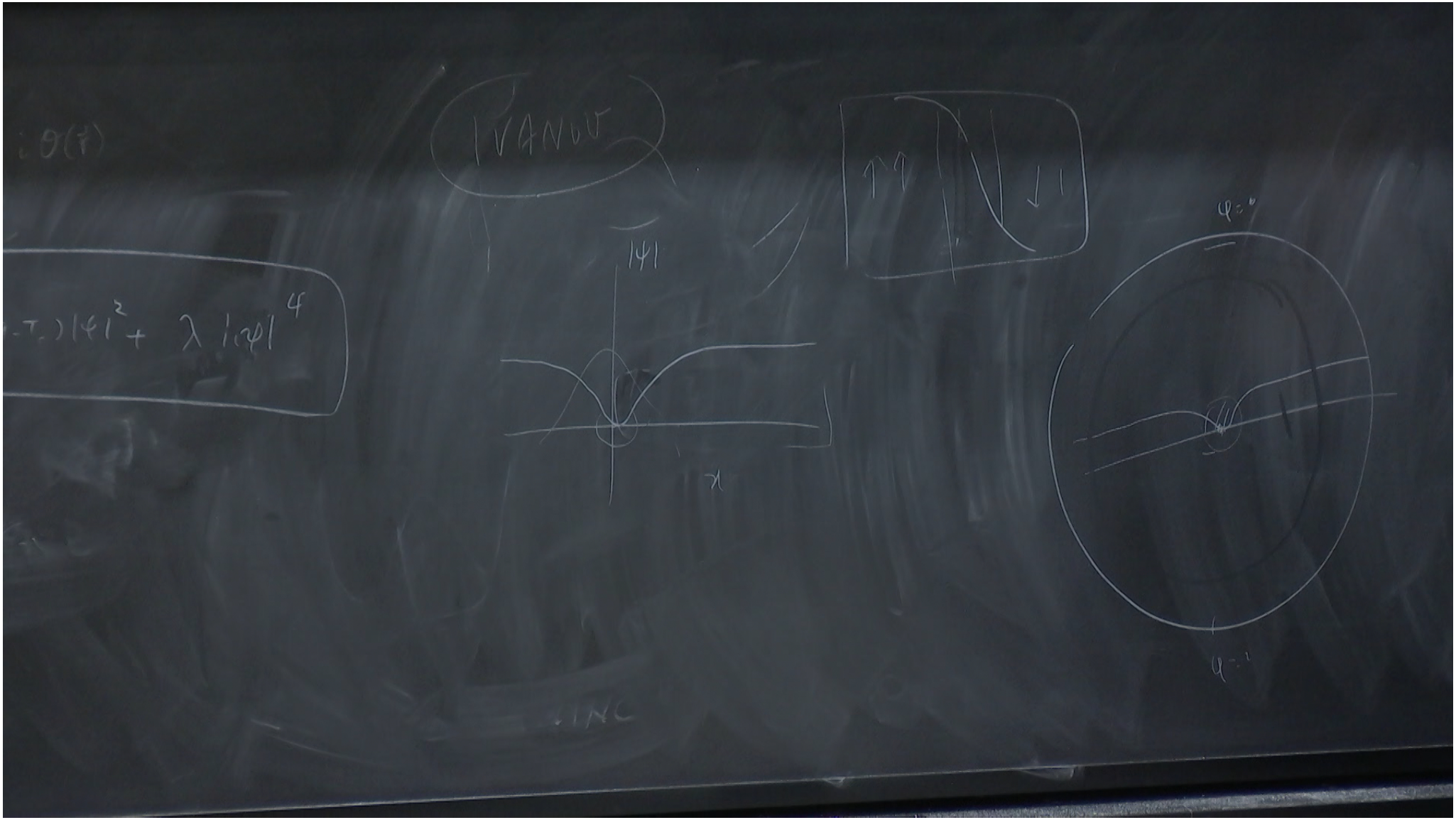

$\sum \varphi_i k_{ij} \varphi_j = \sum \varphi_q k(q) \varphi_q$
$k(q) = k \sum_{\alpha=1}^{d} \cos(q_\alpha a)$
$\int q^2 \varphi(q) \varphi(q) dq$

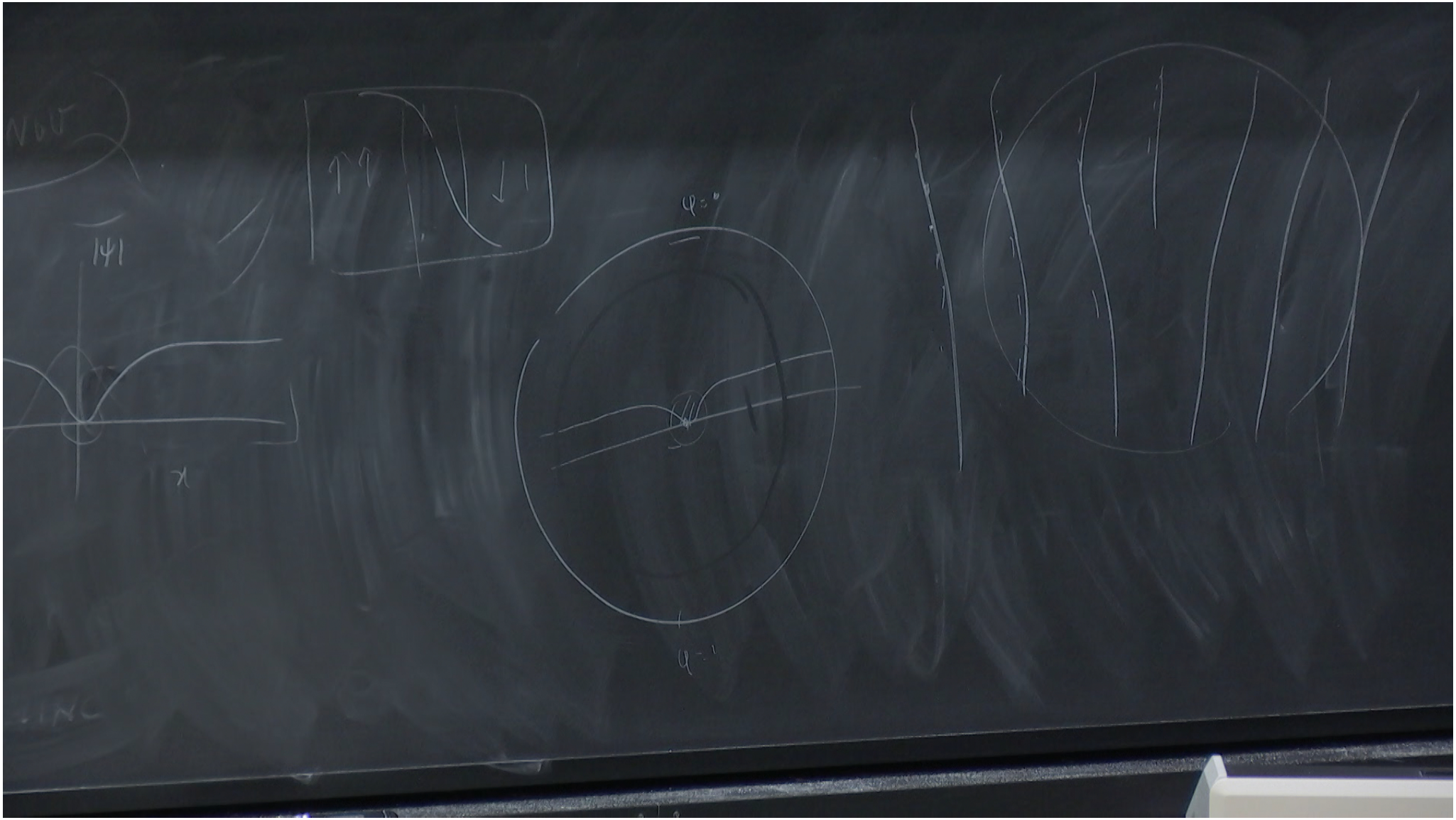

GL Theory
$F[\psi]$
$|\psi(\vec{r})|e^{i\theta(\vec{r})}$
$|\alpha|e^{i\theta(\cdot)}$
$a^\dagger a = n$
$a^\dagger, a \sim \alpha^*, \alpha$
$\vec{\psi}$
$a = \sqrt{n}\, e^{i\theta}$

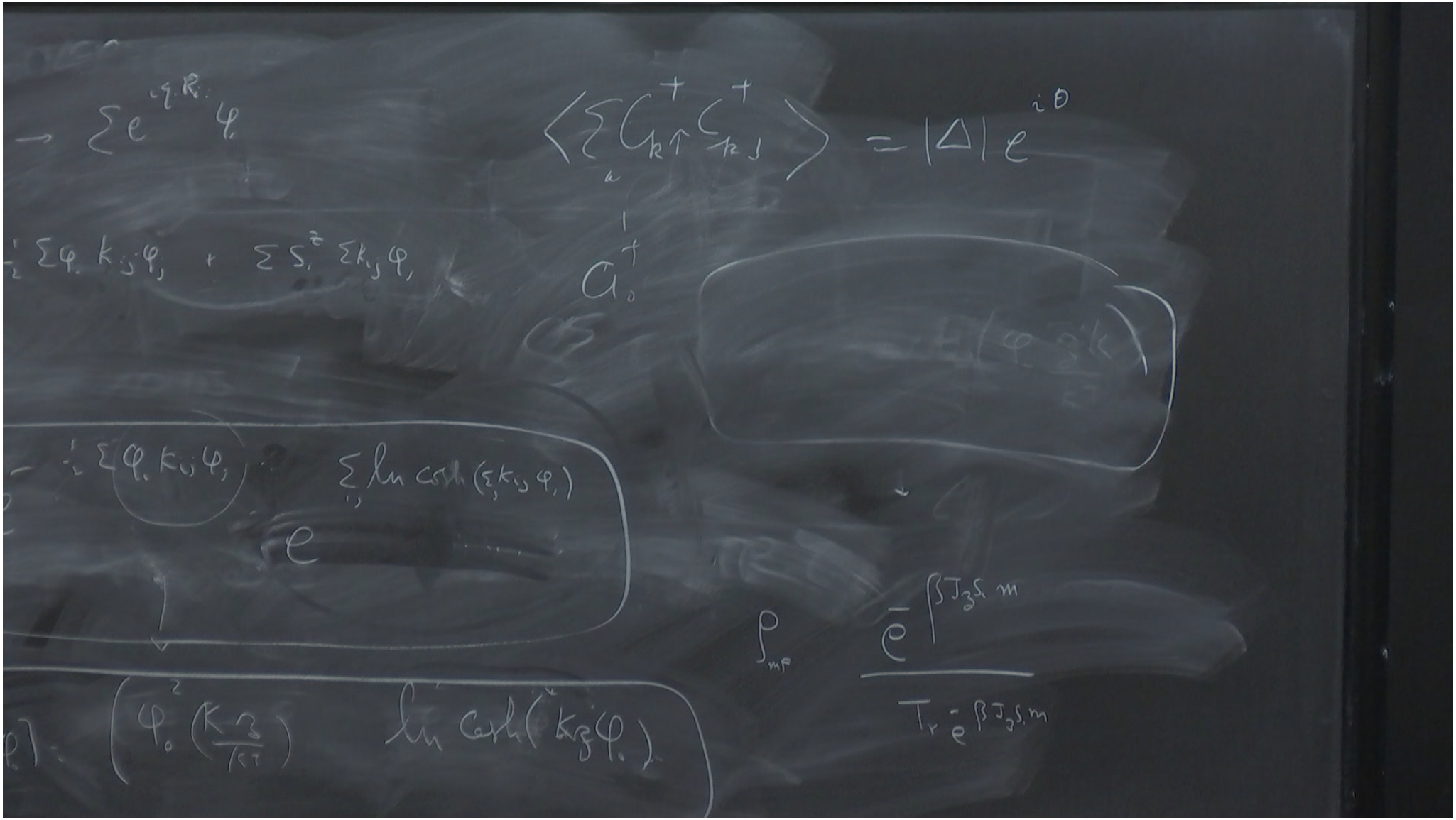

GL Theory
$\theta(\vec{r})$
$F[\psi] = \frac{\hbar^2}{2m}(\nabla\psi)^2 + a(T-T_c)|\psi|^2 + \lambda|\psi|$

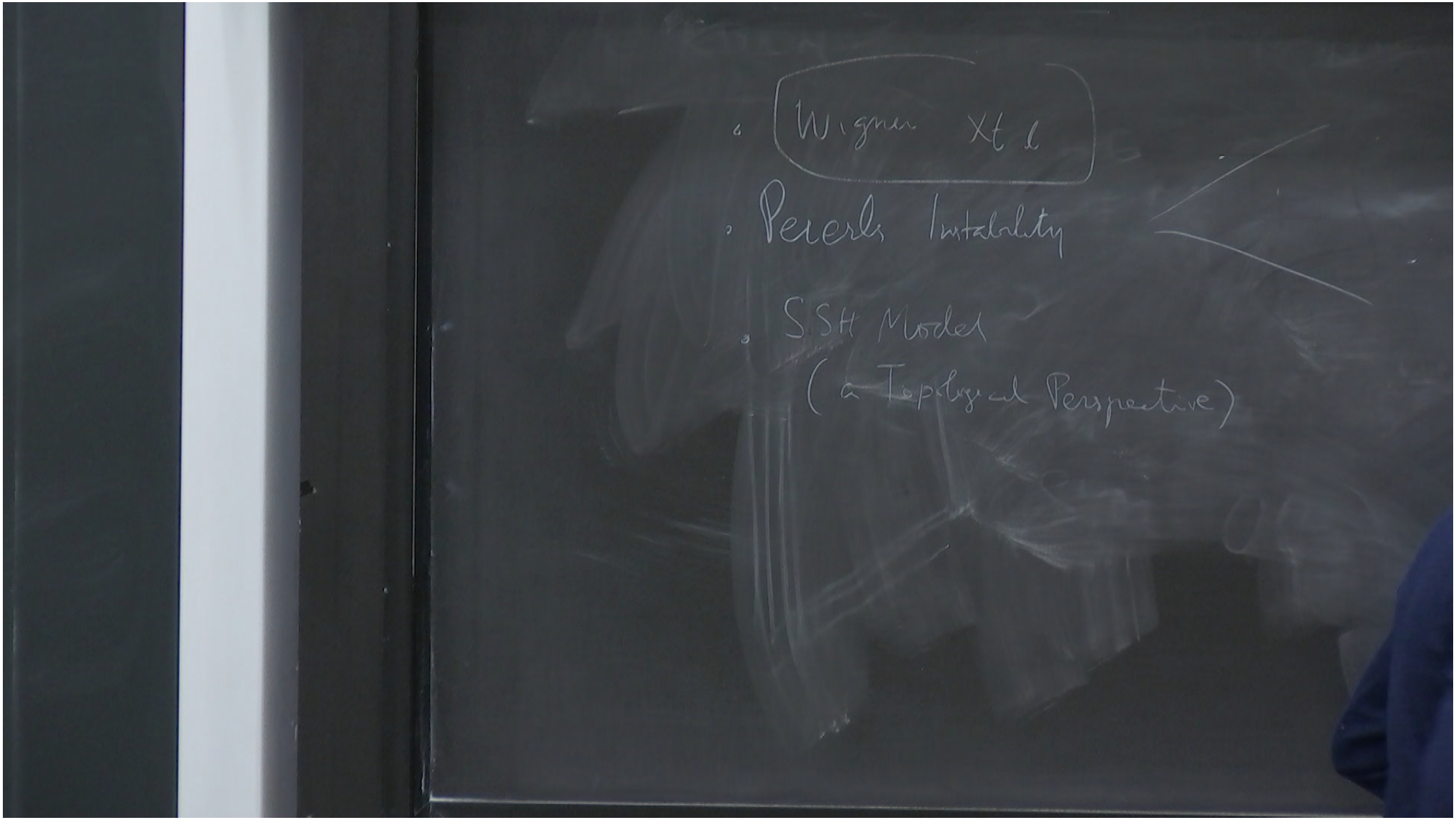

$\lambda |\varphi|^4$
$0 < \varphi < 2\pi$


GL Theory
$\mathcal{F}[\psi] = \frac{\hbar^2}{2m}(\nabla\psi)^2 + a(T-T_c)|\psi|^2 + \lambda|\psi|^4$
$\frac{\hbar^2}{2m}\left(\vec{\nabla} - 2e\frac{\vec{A}}{c\hbar}\right)^2$
$|\psi|$
T


IVANOV
$|\psi|$
T
$\psi = 0$
$\psi = 1$
INC






Wigner Xtl
Peierls Instability
SSH Model
(a Topological Perspective)