Title: 3d A-twist and analytic continuation of path integrals

Speakers: Davide Gaiotto

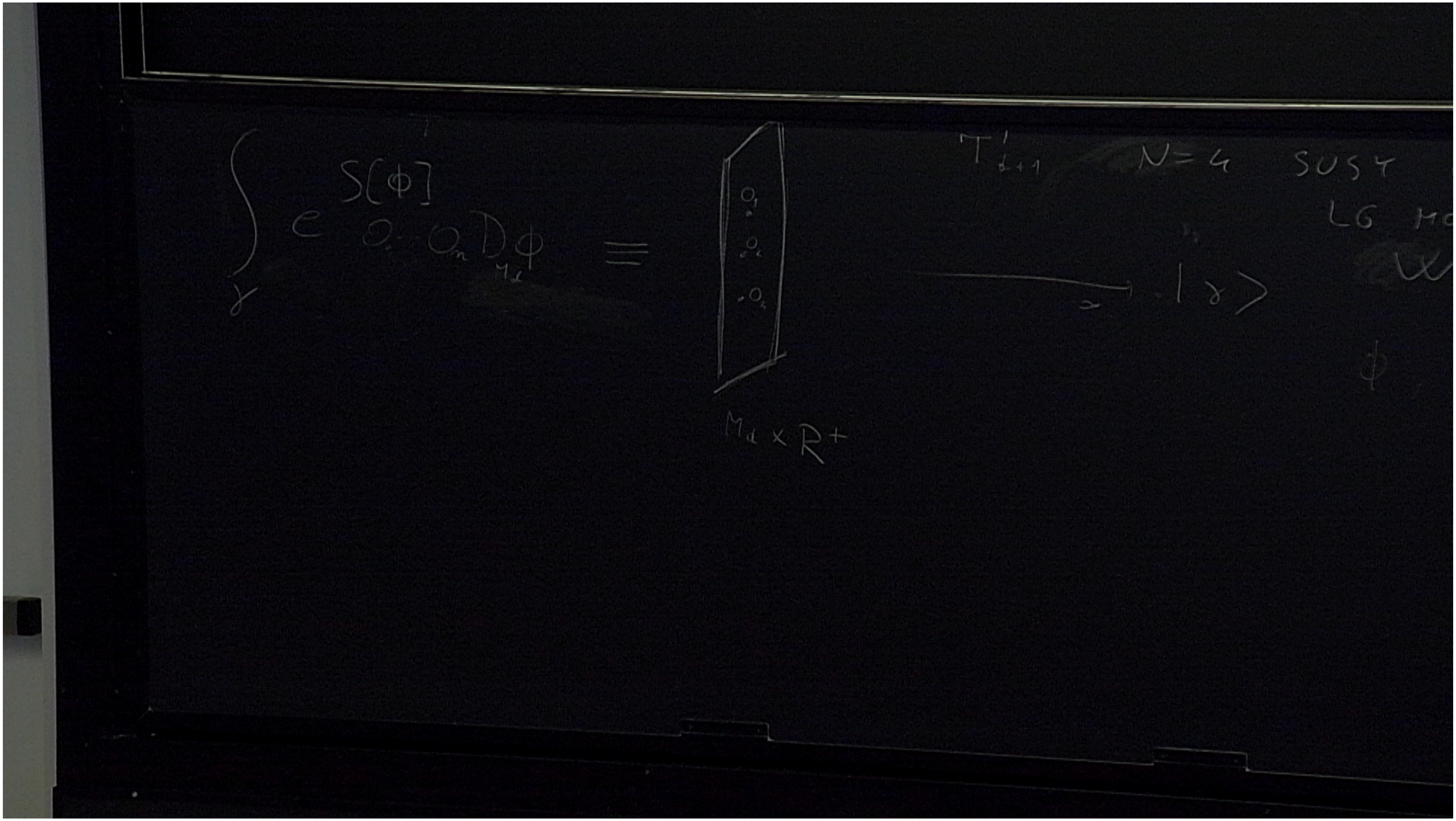
Series: Mathematical Physics

Date: February 20, 2020 - 11:00 AM

URL: http://pirsa.org/20020075

Abstract: I will review the relation between the A twist of 3d N=4 gauge theories and

the conformal blocks/chiral cohomology of 2d chiral algebras.


∫_γ e^{S[Φ]} O_1 ⋯ O_n Dφ_{M_d} ≡
O_1
O_2
O_3
M_d × R+
T'_{d+1}
N = 4 SUSY
LG
|γ>
φ

T'_{d+1} $\qquad N=4$ SUSY QM

LG MODEL

$W = S$

O_1

O_2

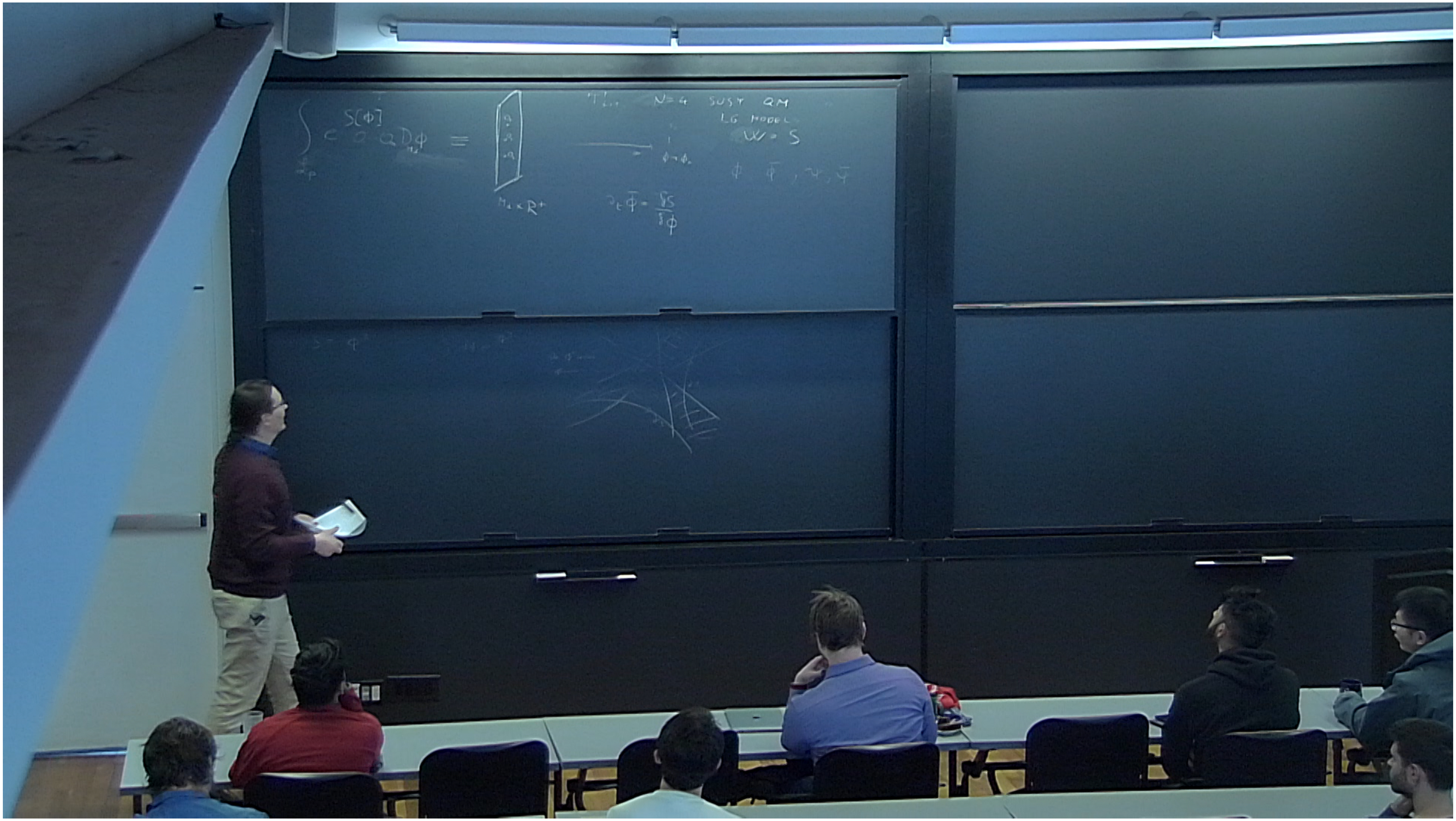
O_3

$M_d \times R^+$

$\phi \to \phi_c$

$\phi, \bar{\phi}, \psi, \bar{\psi}$

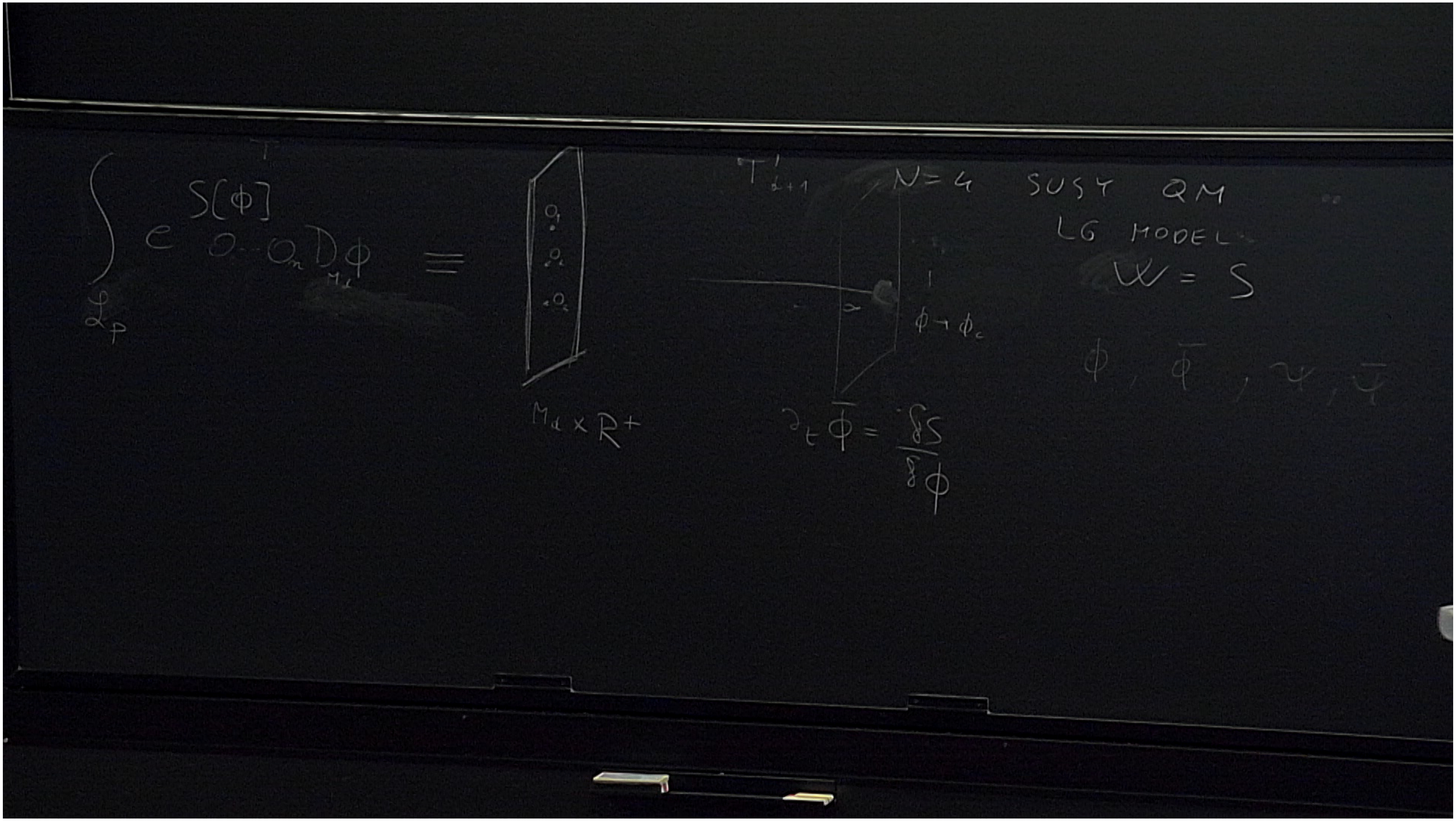
$$\partial_t \bar{\phi} = \frac{\delta S}{\delta \phi}$$

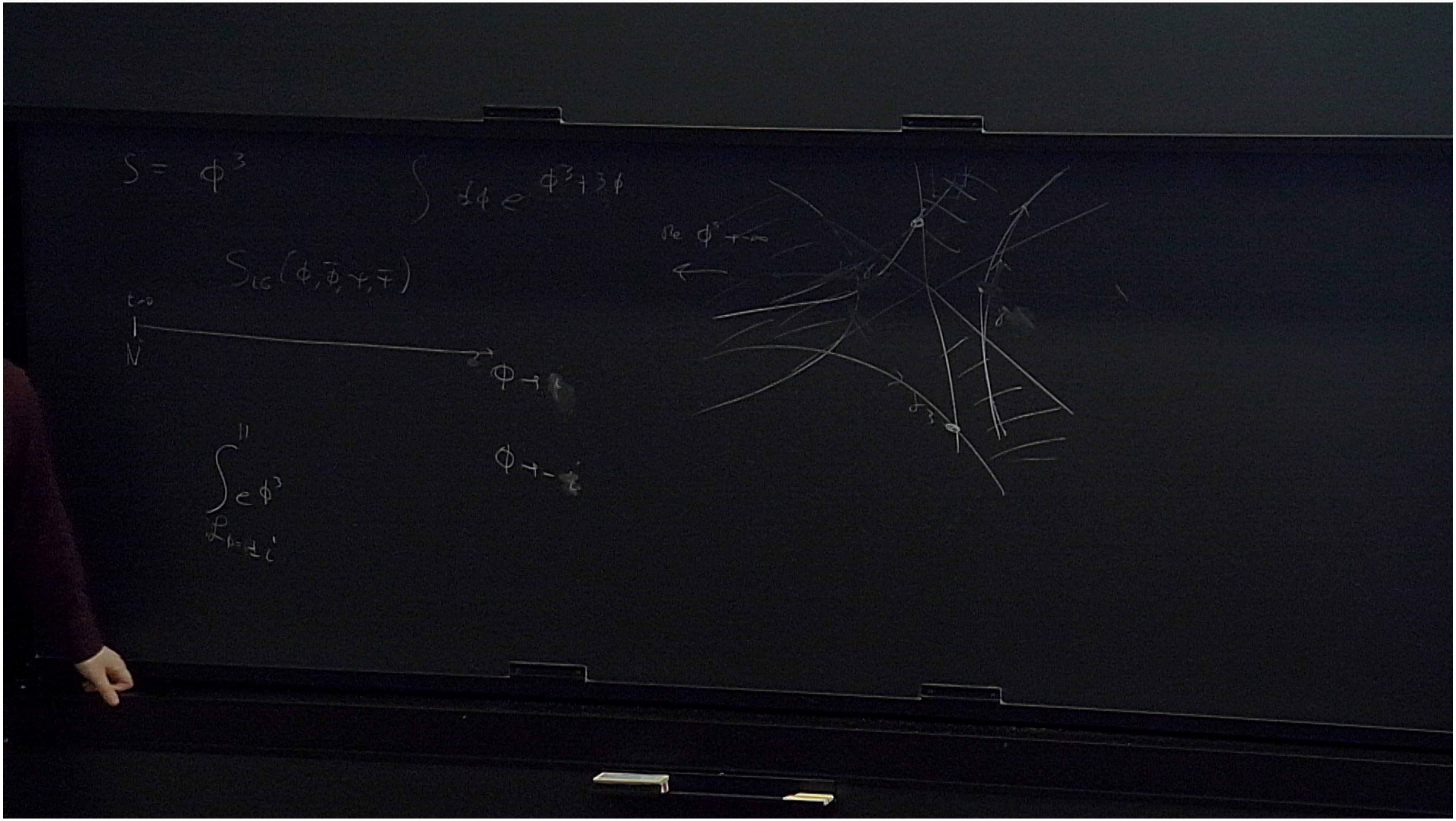


$S = \phi^3$

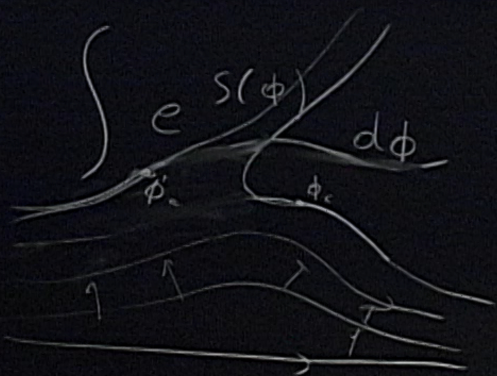
$\int d\phi \, e^{\phi^3 - 3\phi}$

$\mathrm{Re}\, \phi^3 \to +\infty$


$\int_{\mathcal{L}_P} e^{S[\Phi]} O_1 \cdots O_n D\phi_{M_d} \equiv$
O_1
O_2
O_3
$M_d \times R^+$
T'_{d+1}
$\phi \to \phi_c$
$\partial_t \bar{\phi} = \frac{\delta S}{\delta \phi}$
N = 4 SUSY QM
LG MODEL
$W = S$
$\phi, \bar{\phi}, \psi, \bar{\psi}$


S = φ³
∫ dφ e^{φ³+3φ}
S_LG(φ, φ̄, ψ, ψ̄)
Re φ³ → -∞
φ → i
φ → -i

$$\int e^{S(\phi)} d\phi$$



$$\dot{\phi} = -\frac{\partial S}{\partial \phi}$$

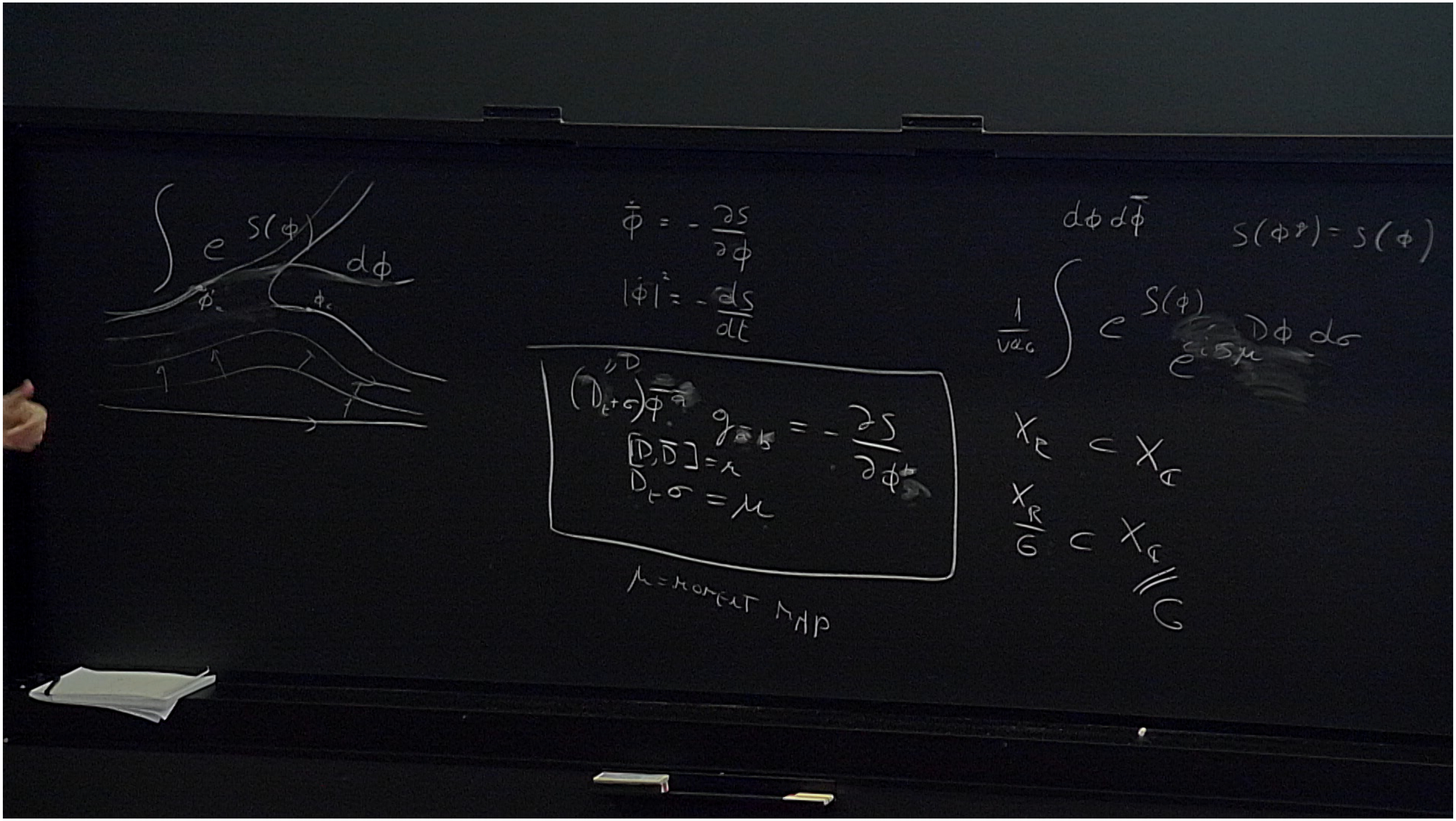
$$|\dot{\phi}|^2 = -\frac{dS}{dt}$$

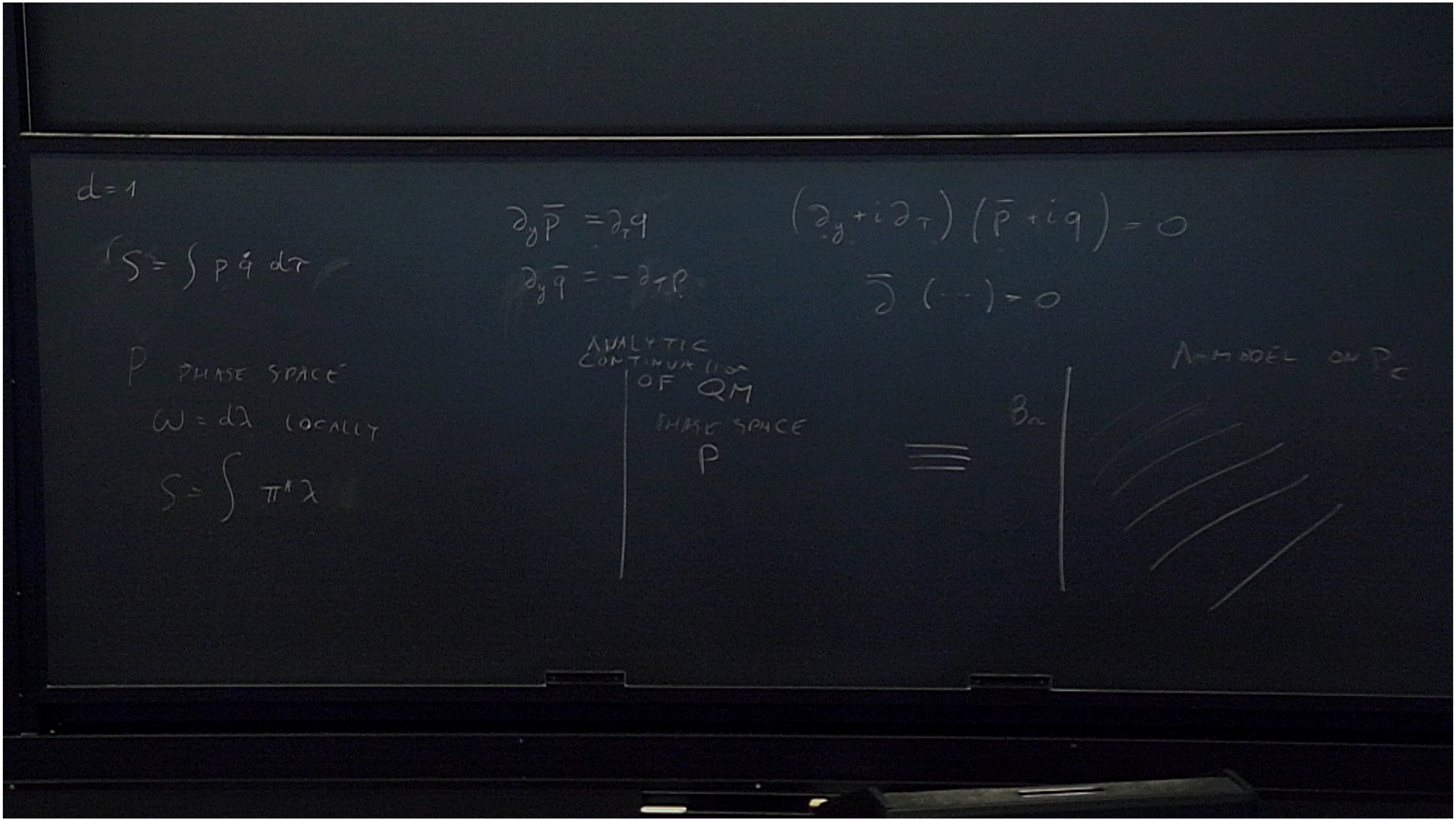
$$\dot{\phi}^{\bar{\mu}} g_{\bar{\mu}\nu} = -\frac{\partial S}{\partial \phi^{\nu}}$$

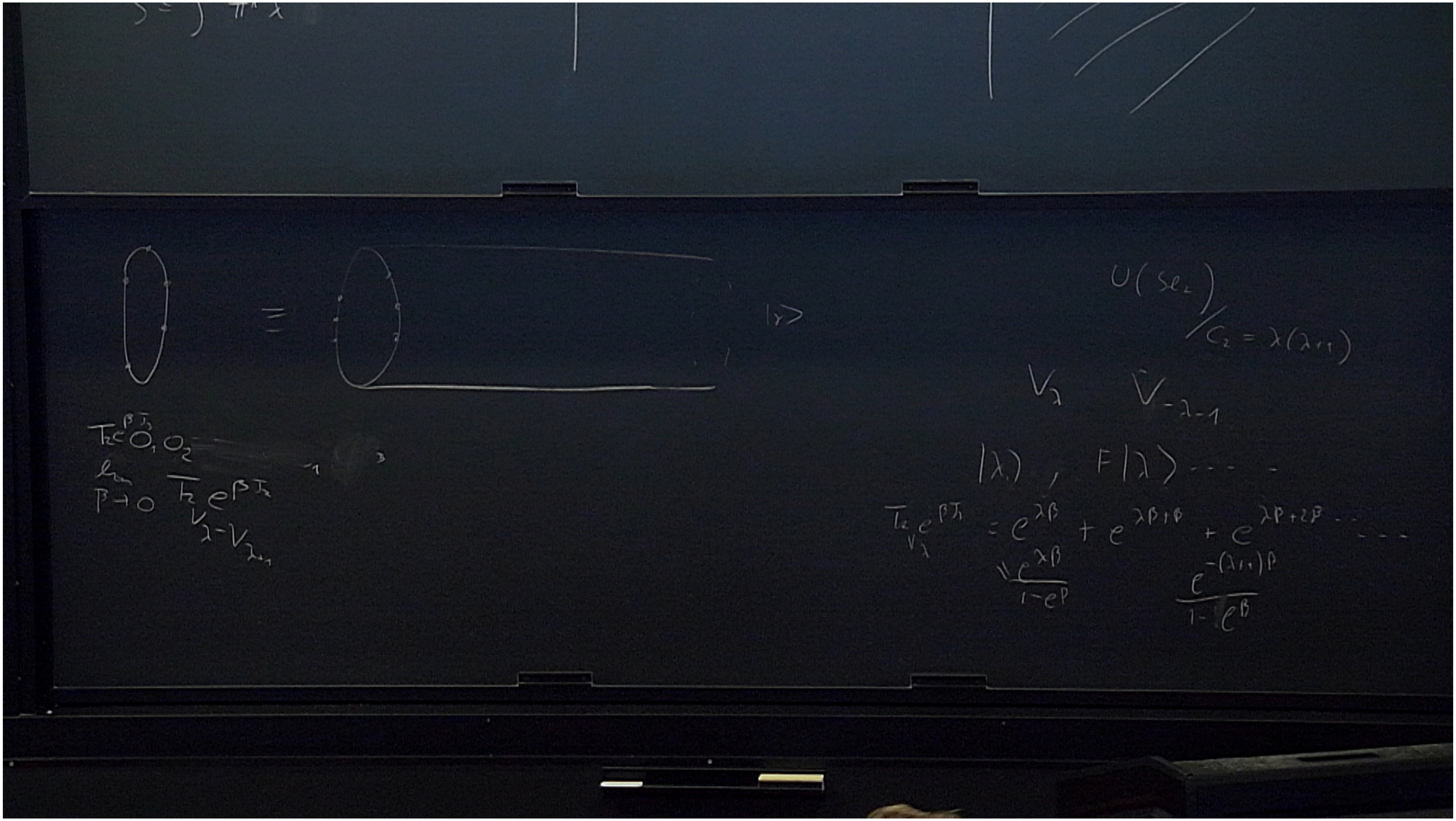
$$d\phi \, d\bar{\phi}$$

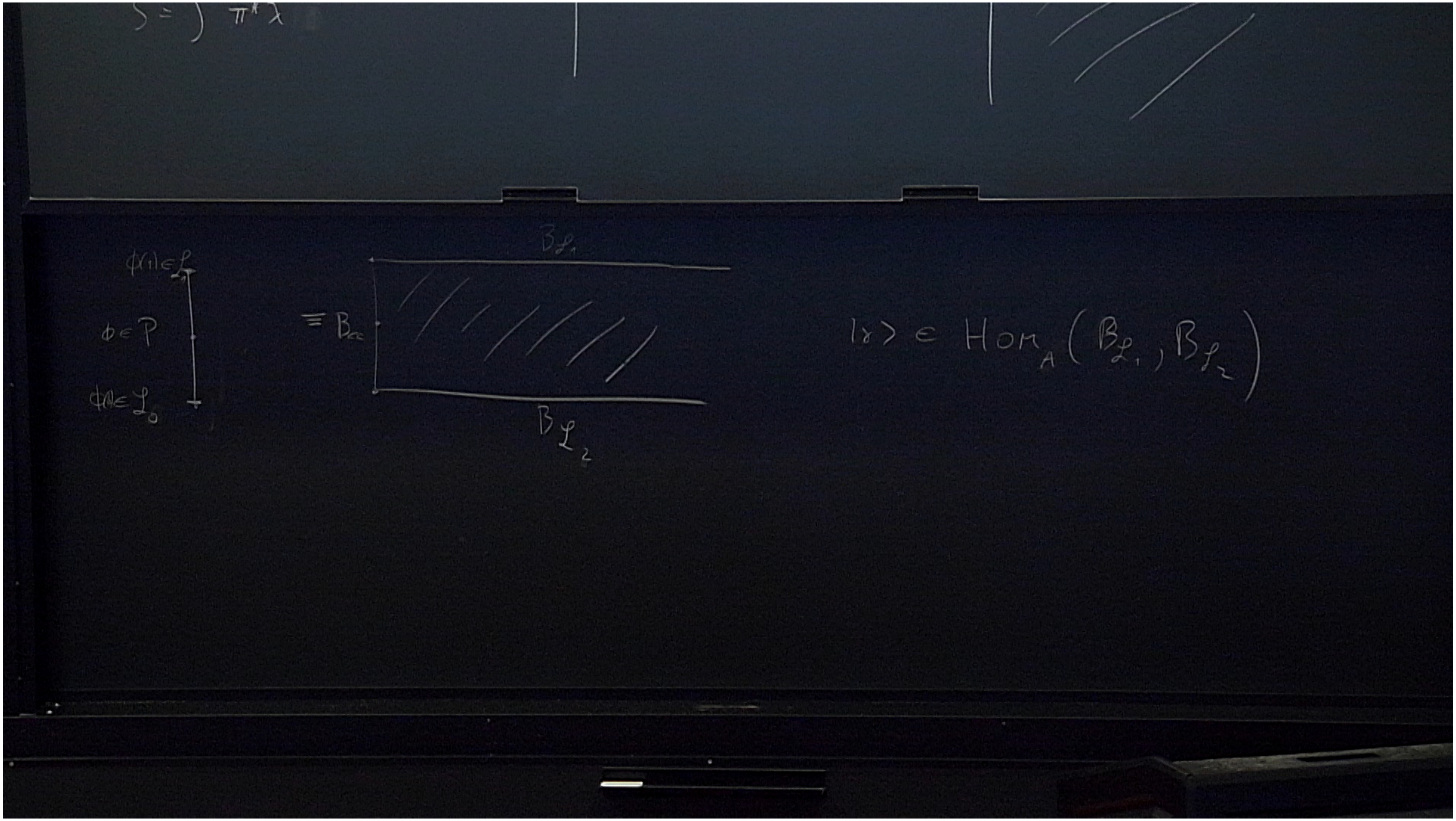
$$S(\phi g) = S(\phi)$$

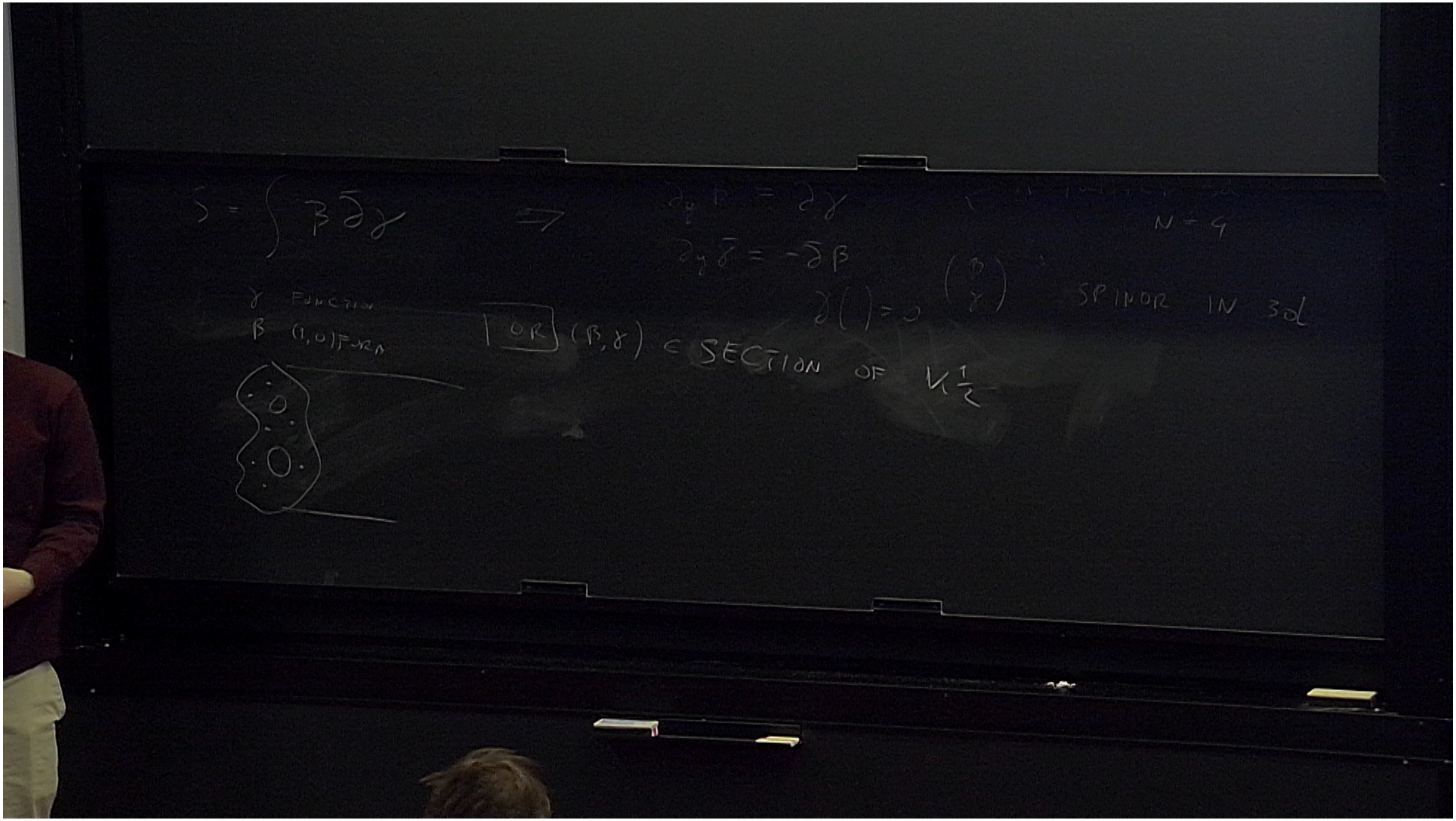
$$\int e^{S(\phi)} \frac{D\phi}{G}$$


∫ e^{S(φ)} dφ
φ̇ = − ∂S/∂φ
|φ̇|² = − dS/dt
[D, D̄] = ∂_t
D_t σ = μ
= − ∂S/∂φ
μ = MOMENT MAP
dφ dφ̄
S(φg) = S(φ)
X_R ⊂ X_C
X_R/G ⊂ X_C//G

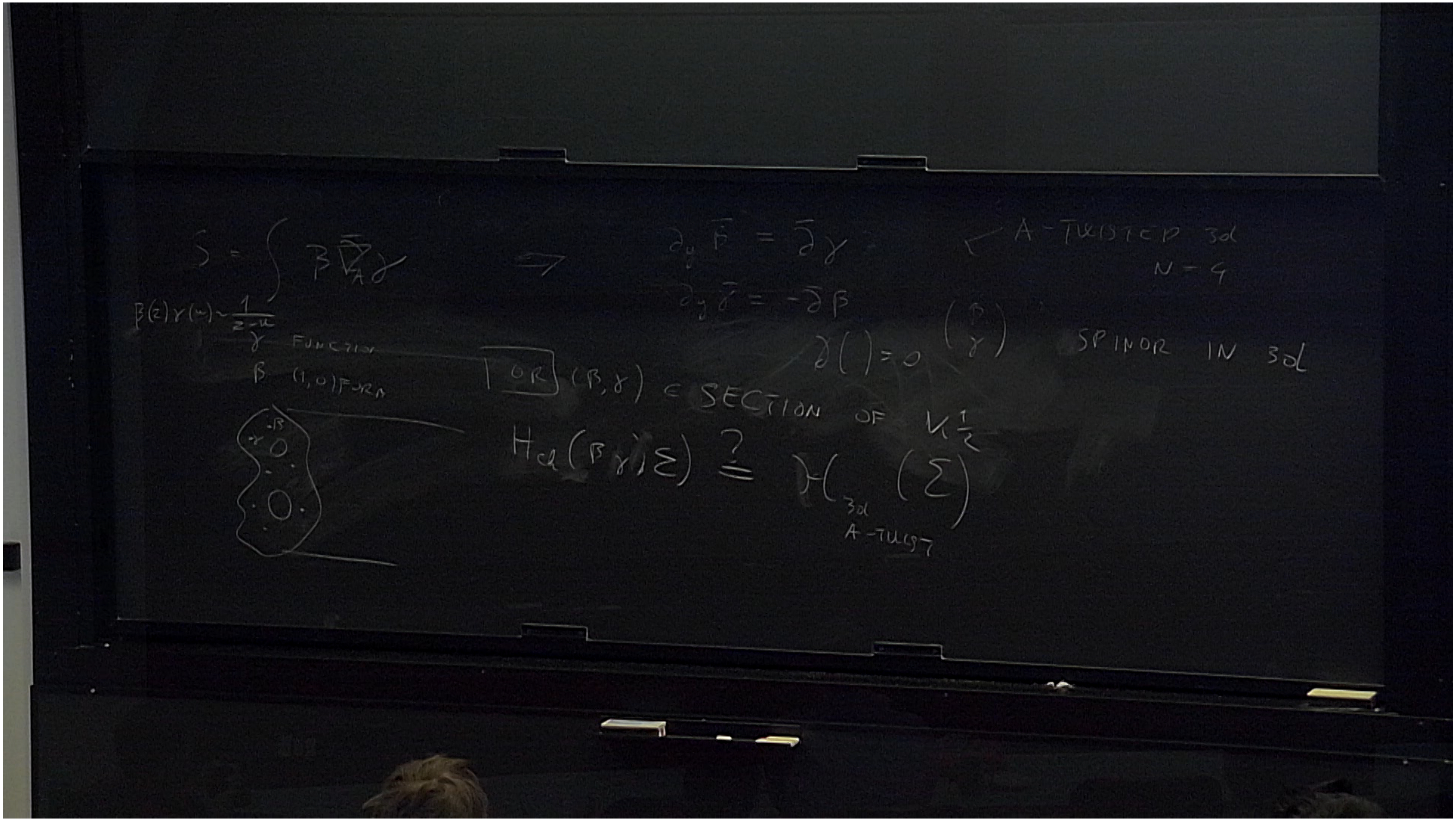

$d = 1$
$S = \int p \dot{q} \, d\tau$
P PHASE SPACE
$\omega = d\lambda$ LOCALLY
$S = \int \pi^* \lambda$
$\partial_y \bar{p} = \partial_\tau q$
$\partial_y \bar{q} = -\partial_\tau p$
$(\partial_y + i\partial_\tau)(\bar{p} + iq) = 0$
$\bar{\partial}(\cdots) = 0$
ANALYTIC CONTINUATION OF QM
PHASE SPACE
P
$\equiv$
B_{cc}
A-MODEL ON $P_{\mathbb{C}}$


U(sl2)
C2 = λ(λ+1)
|λ>
Vλ   V-λ-1
|λ〉 , F|λ〉 ...
Tr e^{βJ3} O1 O2
lim β→0 Tr e^{βJ3}
Vλ - Vλ+1
Tr_{Vλ} e^{βJ3} = e^{λβ} + e^{λβ+β} + e^{λβ+2β} ...
e^{λβ} / 1-e^β
e^{-(λ+1)β} / 1-e^β


$\phi(1) \in \mathcal{L}_1$
$\phi \in P$
$\phi(0) \in \mathcal{L}_0$
$\equiv B_{cc}$
$B_{\mathcal{L}_1}$
$B_{\mathcal{L}_2}$
$|\gamma\rangle \in \mathrm{Hom}_A(B_{\mathcal{L}_1}, B_{\mathcal{L}_2})$



γ FUNCTION
β (1,0) FORM
OR (β,γ) ∈ SECTION OF K^1/2
N = 4
SPINOR IN 3d


S = ∫ β ∇̄_A γ
β(z)γ(w) ~ 1/(z−w)
γ FUNCTION
β (1,0) FORM
∂_y β̄ = ∂̄ γ
∂_y γ̄ = −∂̄ β
A-TWISTED 3d
N = 4
∂( ) = 0
SPINOR IN 3d
OR (β, γ) ∈ SECTION OF K^{1/2}
H_ch(β γ; Σ) ?= H_{3d A-TWIST}(Σ)