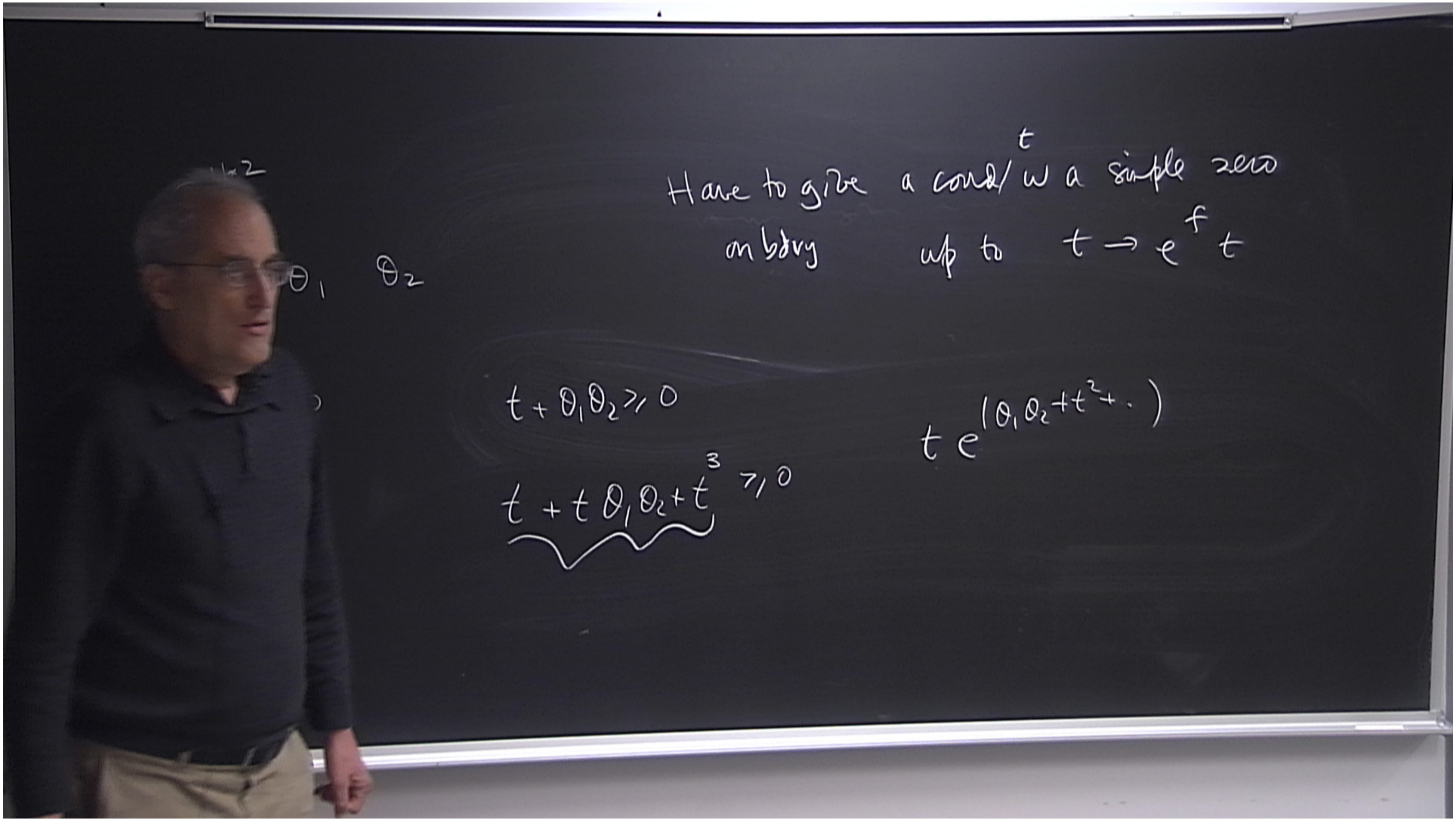
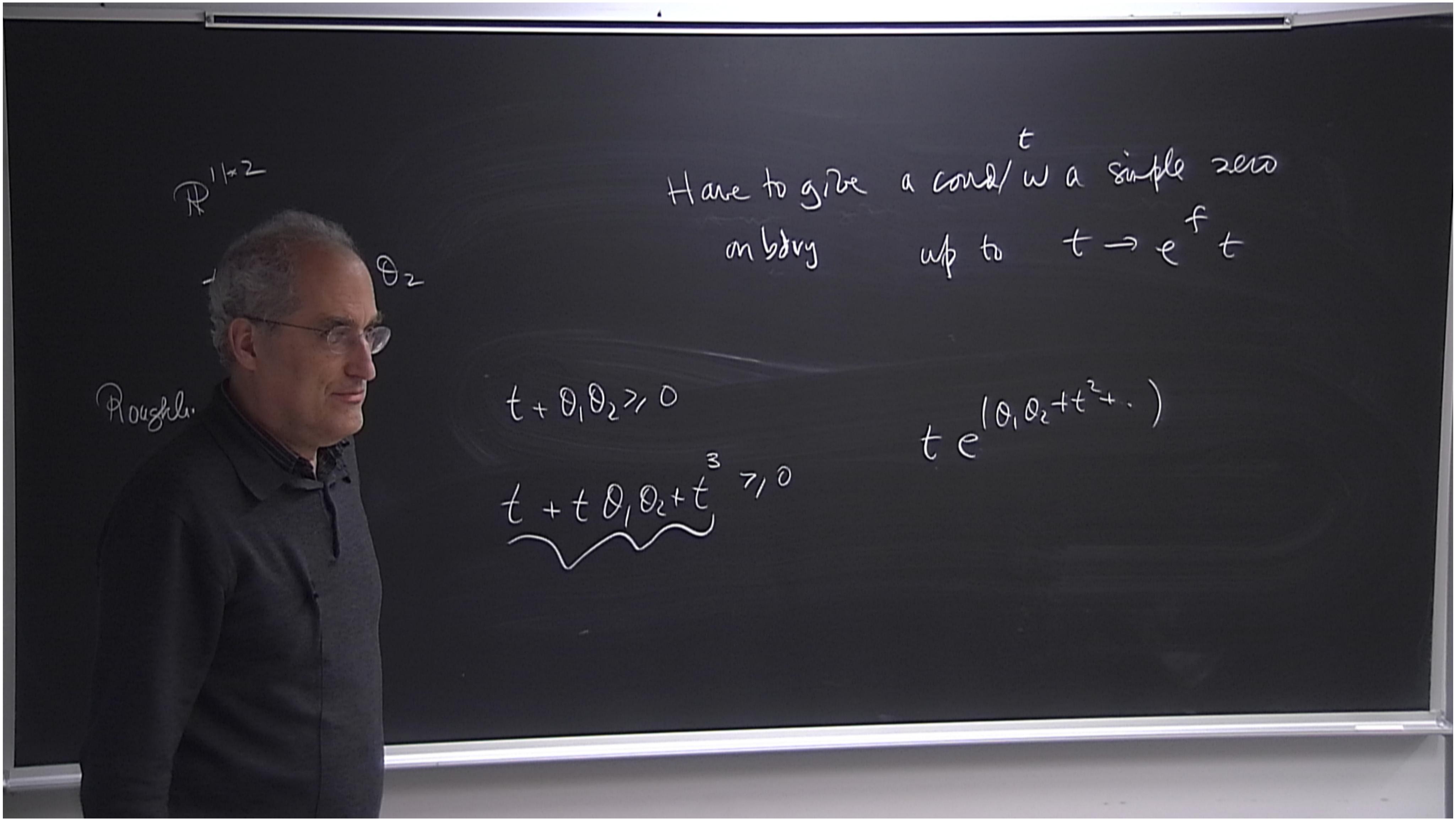
Title: Discussion 3

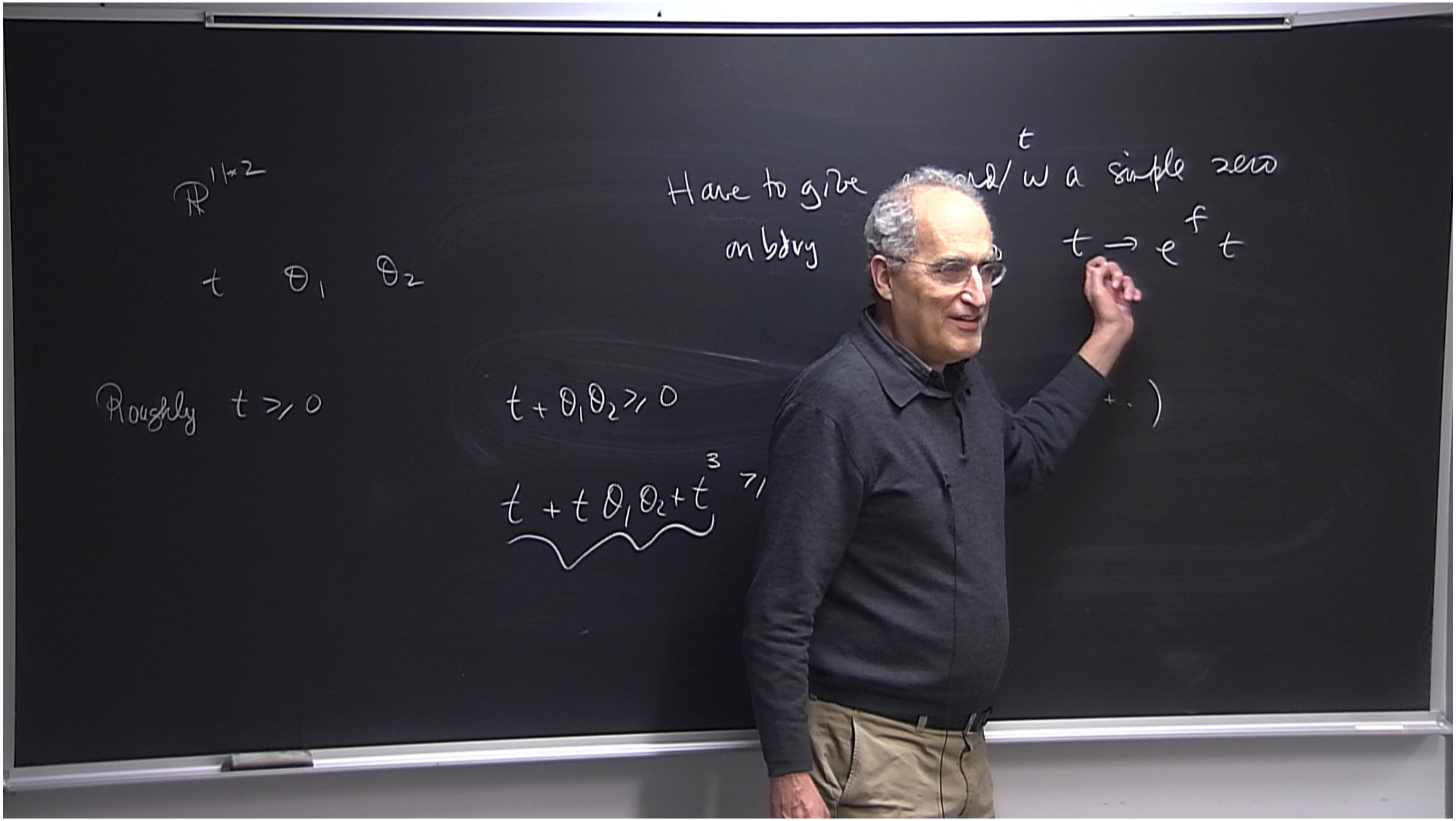
Date: Apr 23, 2015 04:45 PM

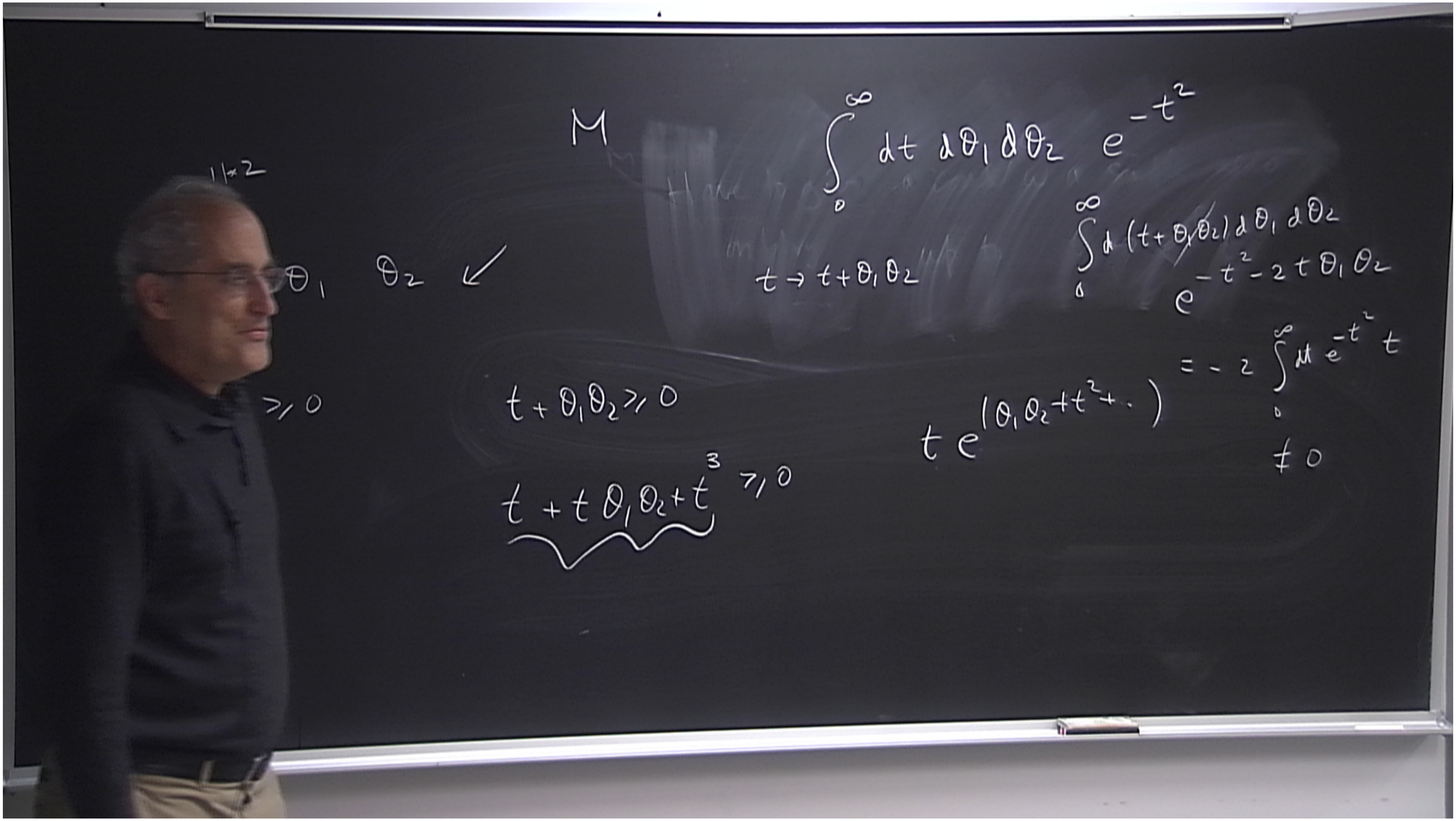
URL: http://pirsa.org/15040183

Abstract:

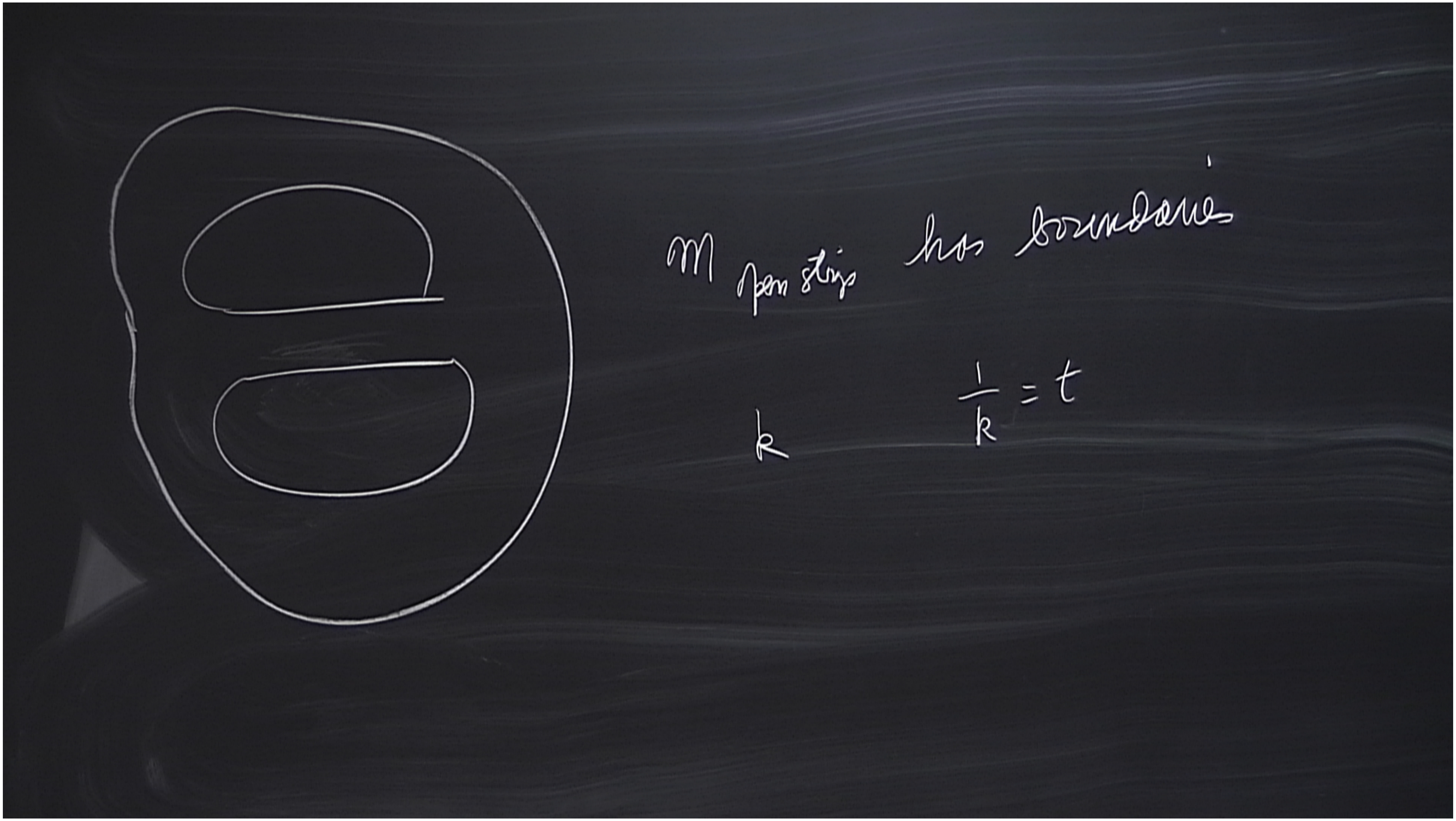

Have to give a cond/ w a simple zero
on bdry up to $t \to e^f t$
$\theta_1 \quad \theta_2$
$t + \theta_1\theta_2 \geq 0$
$t + t\,\theta_1\theta_2 + t^3 \geq 0$
$t\,e^{(\theta_1\theta_2 + t^2 + \cdots)}$

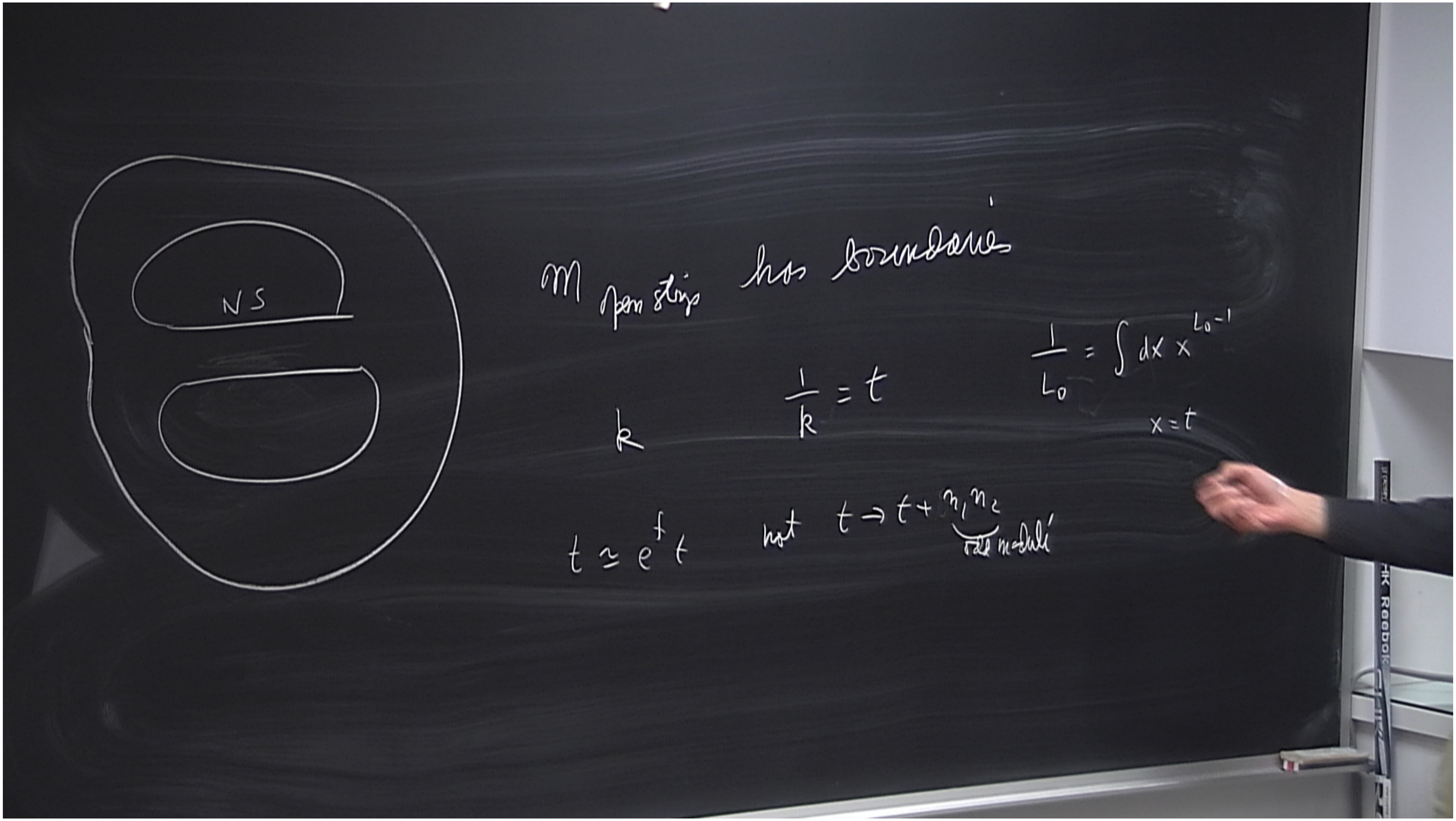

$\mathbb{R}^{1|*2}$
θ_2
Roughly
Have to give a cond/ t w a simple zero
on bdry
up to $t \to e^f t$
$t + \theta_1\theta_2 \geq 0$
$t\, e^{(\theta_1\theta_2 + t^2 + \cdot\,)}$
$t + t\,\theta_1\theta_2 + t^3 \geq 0$


R 1|2
Have to give
w a simple zero
on bdry
t → e f t
t θ1 θ2
Roughly t ≥ 0
t + θ1θ2 ≥ 0
t + t θ1θ2 + t 3

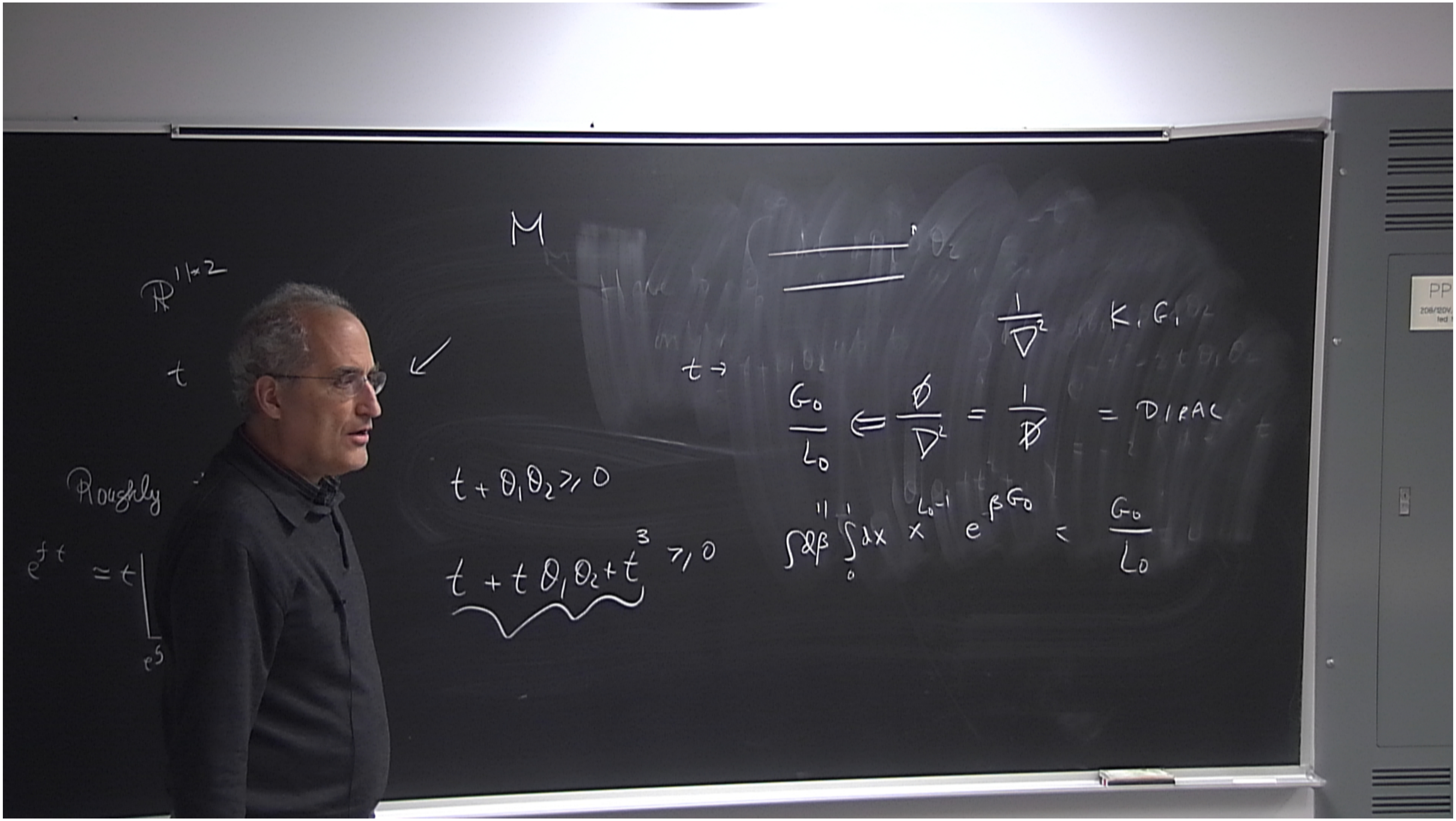


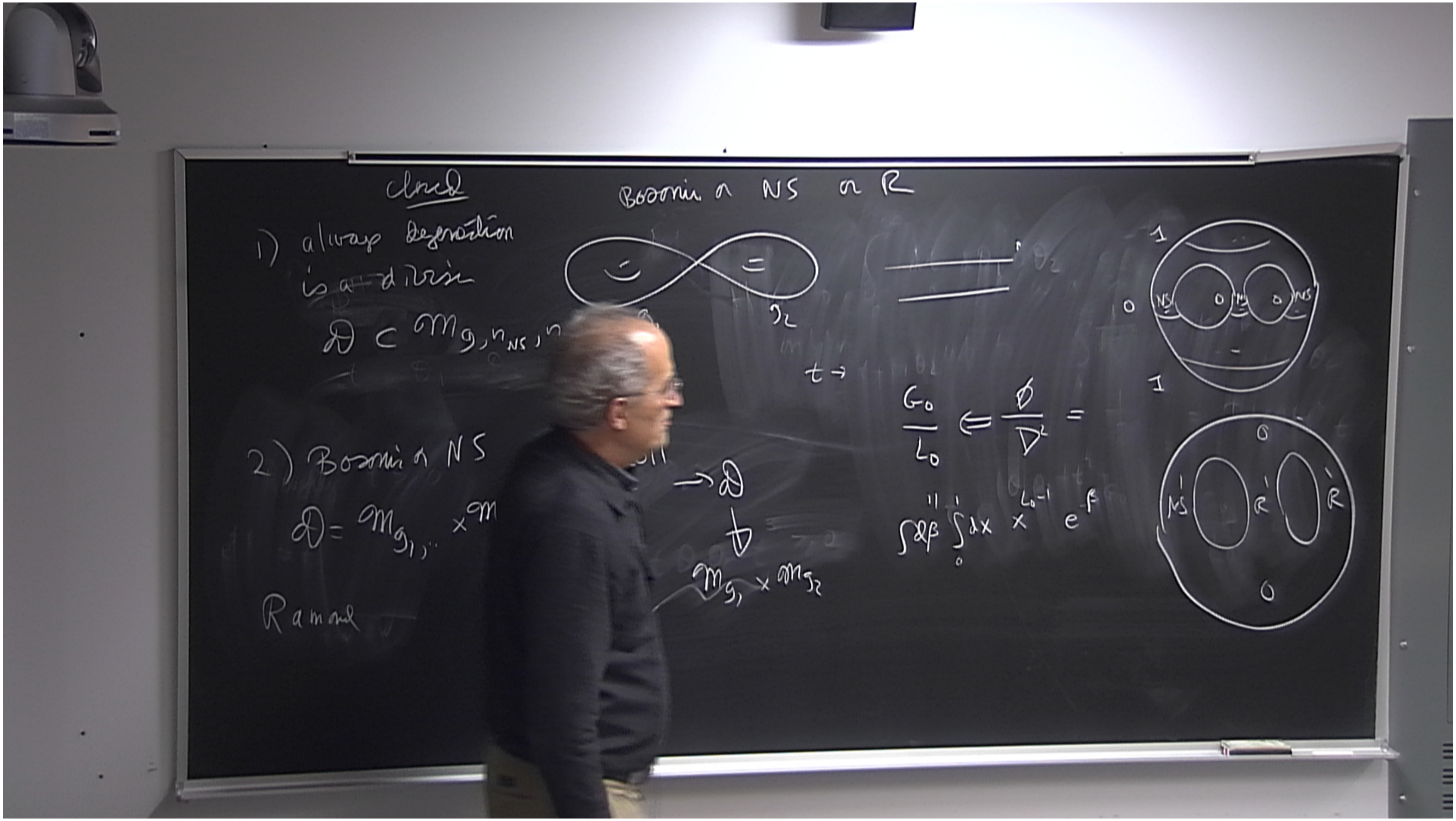
M
11*2
$\theta_1 \quad \theta_2$
≥ 0
$\int_0^\infty dt\, d\theta_1\, d\theta_2\, e^{-t^2}$
$t \to t+\theta_1\theta_2$
$\int_0^\infty d(t+\theta_1\theta_2)\, d\theta_1\, d\theta_2\, e^{-t^2-2t\theta_1\theta_2}$
$= -2\int_0^\infty dt\, e^{-t^2}\, t$
$\neq 0$
$t+\theta_1\theta_2 \geq 0$
$t\, e^{(\theta_1\theta_2+t^2+\dots)}$
$t+t\theta_1\theta_2+t^3 \geq 0$


m open strips has boundaries
k
1/k = t



NS
M open strings has boundaries
k
1/k = t
1/L0 = ∫ dx x^(L0 - 1)
x = t
t ≃ e^f t
not t → t + n1 n2
moduli


M
Roughly
t + θ₁θ₂ ≥ 0
t + t θ₁θ₂ + t³ ≥ 0
= DIRAC
K, G₁


closed
Bosonic or NS or R
1) always Degeneration
2) Bosonic or NS
Ramond
t →

Bosonic String

If one wants a conformal formalism

vertex op θ must be annihilated

by b_n, $n \geq 0$

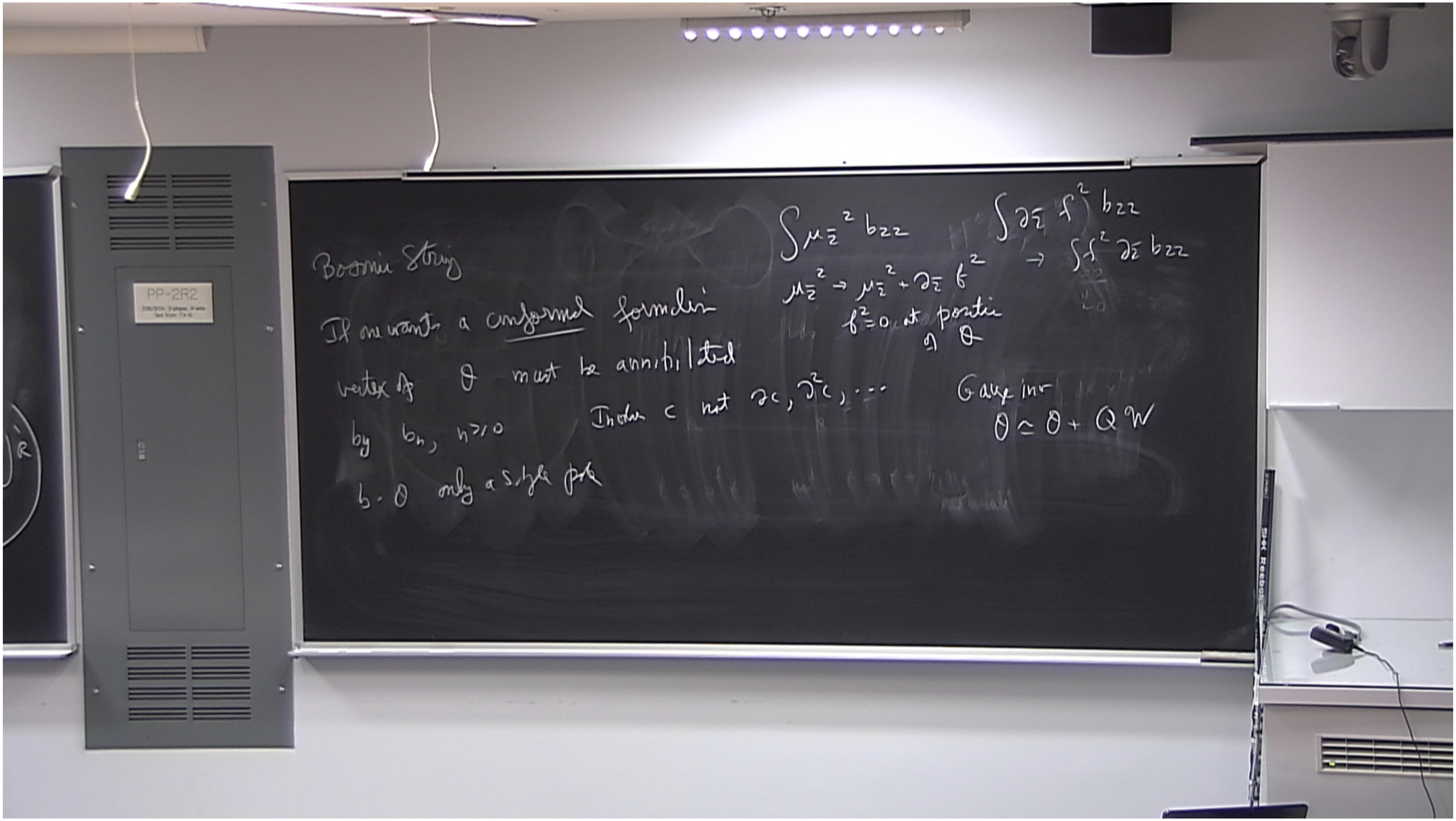
$b \cdot \theta$ only a single pole

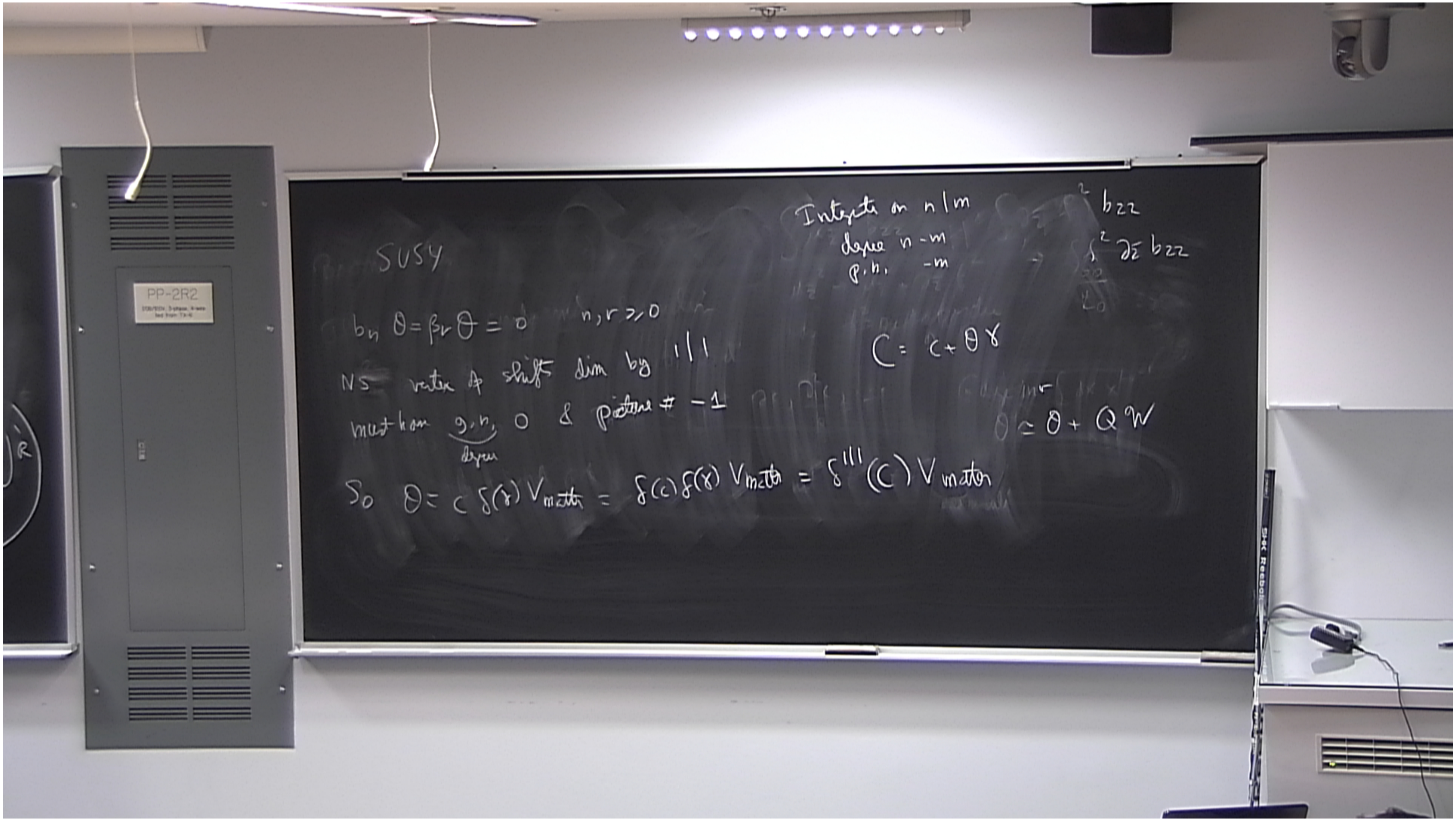
Involve c not ∂c, $\partial^2 c$, ...

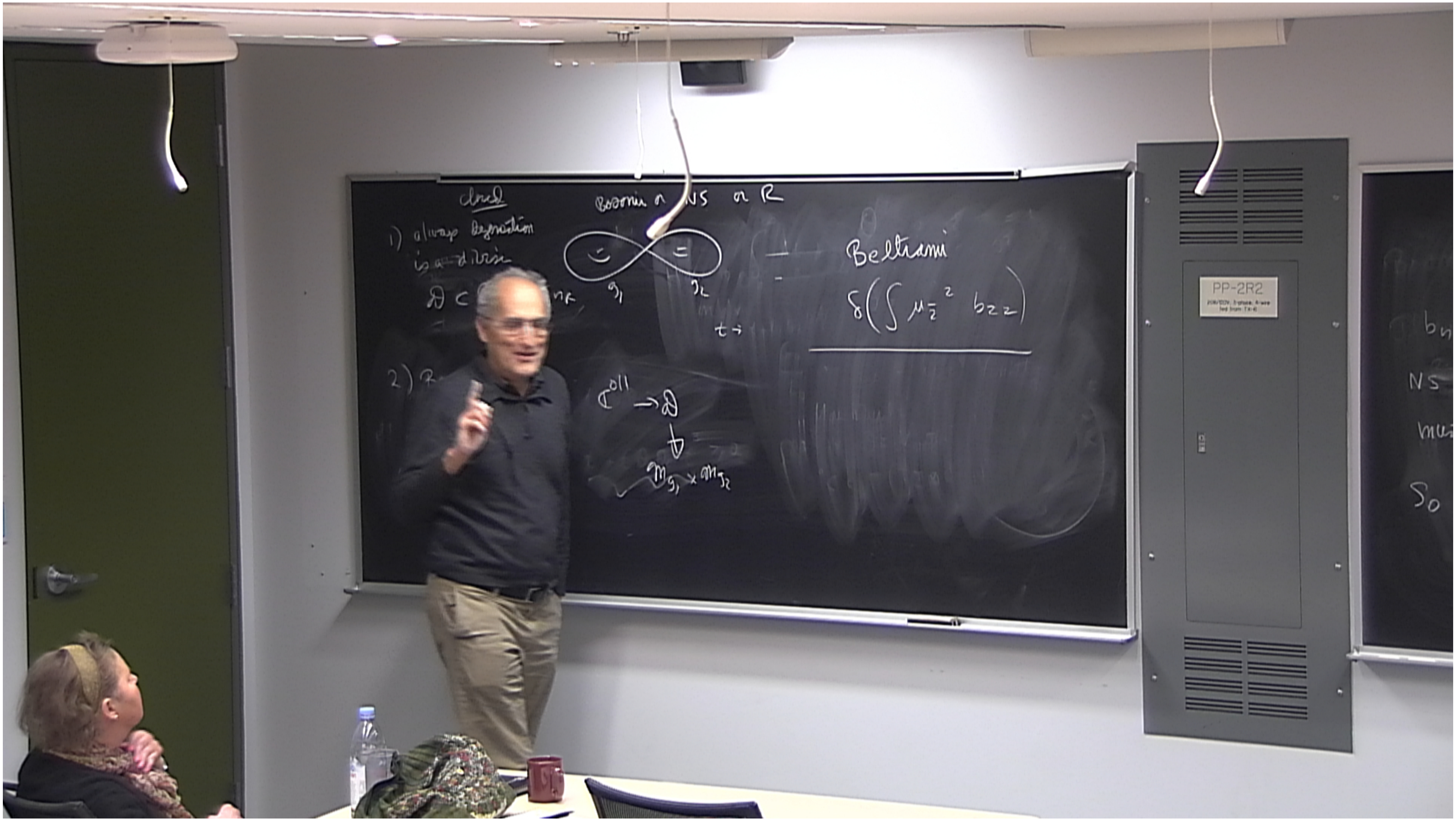
$\frac{G_0}{L_0}$

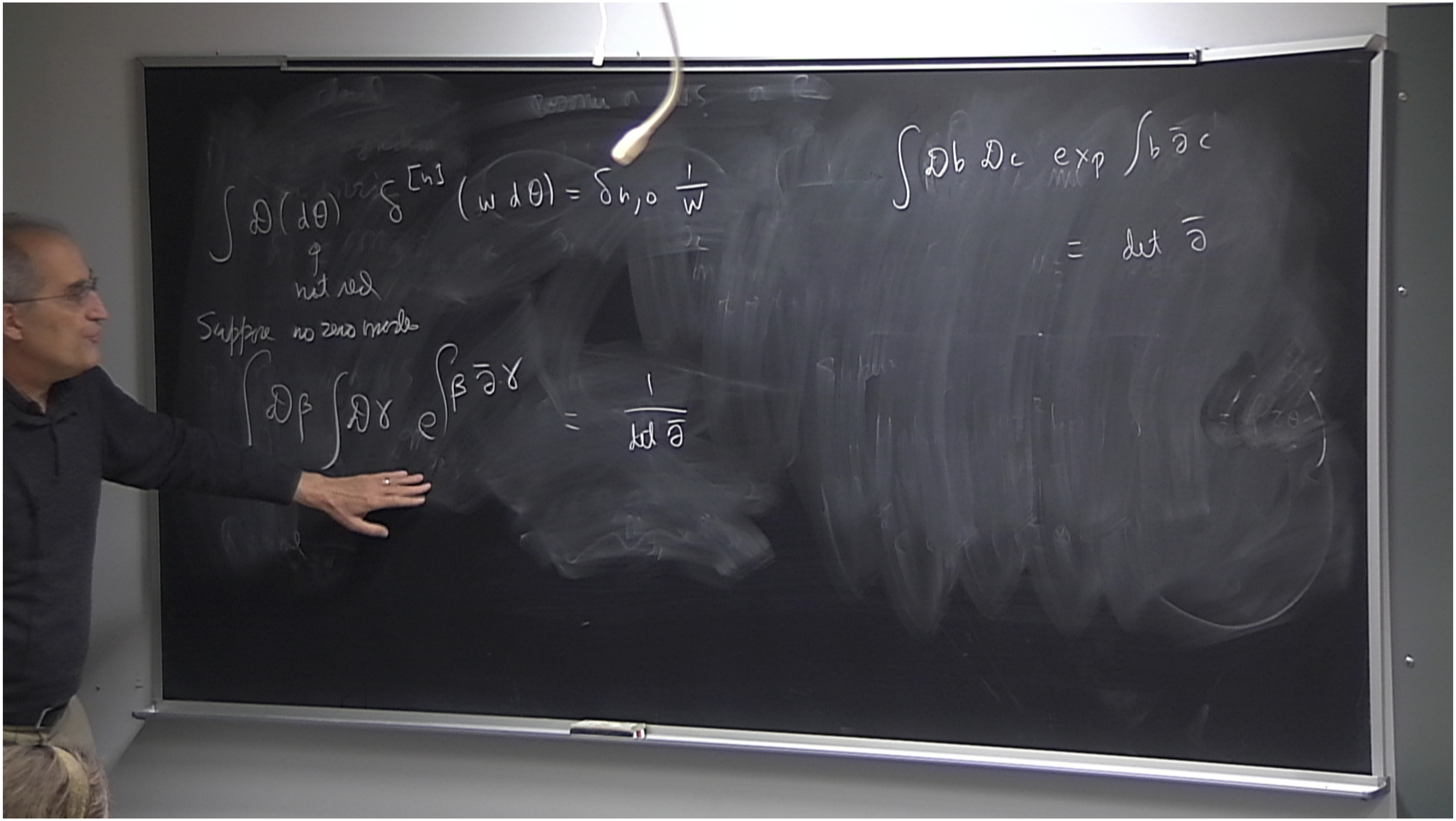
$\frac{1}{L_0} = \int dx \, x^{L_0 - 1}$

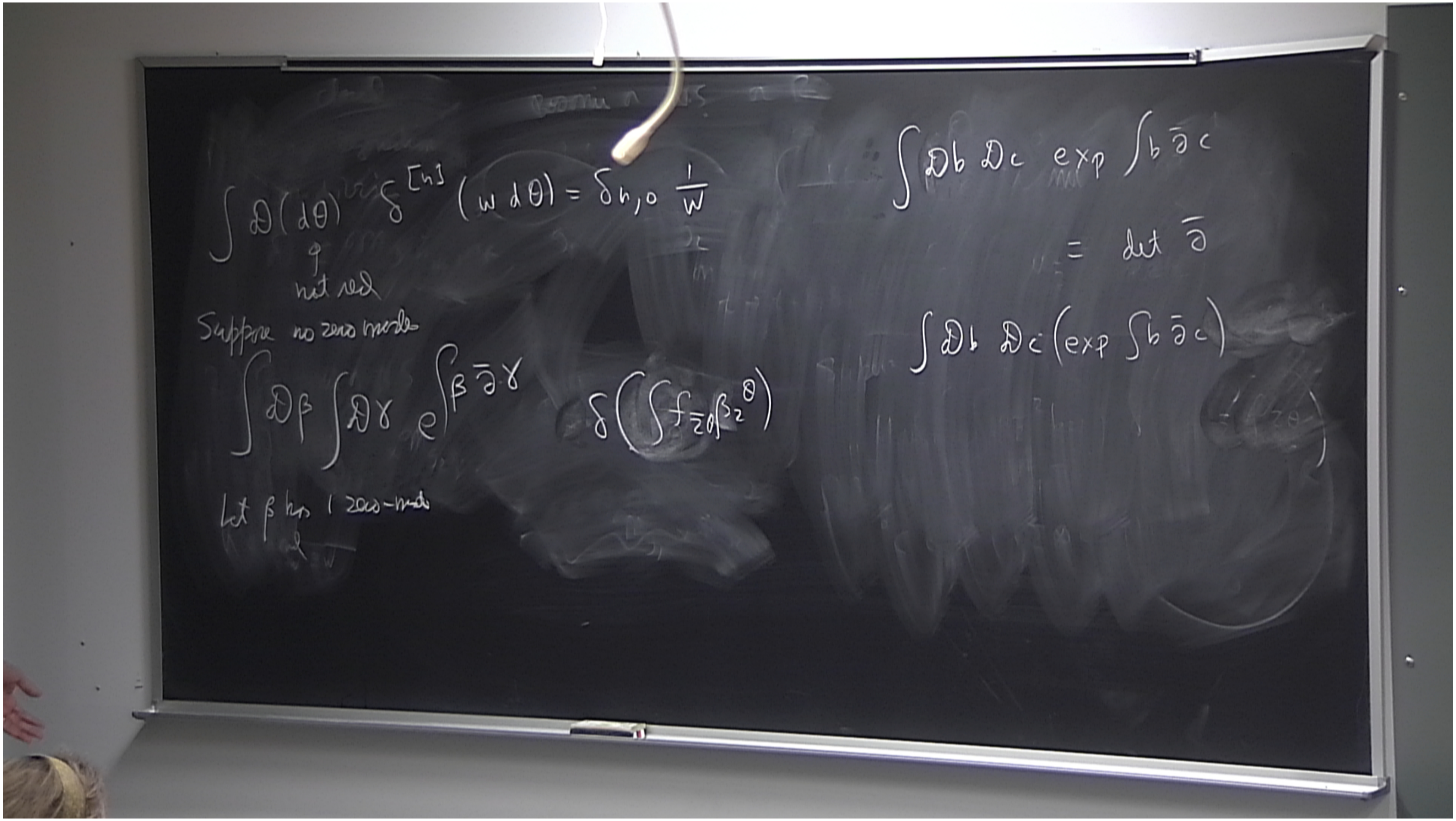
$x = t$

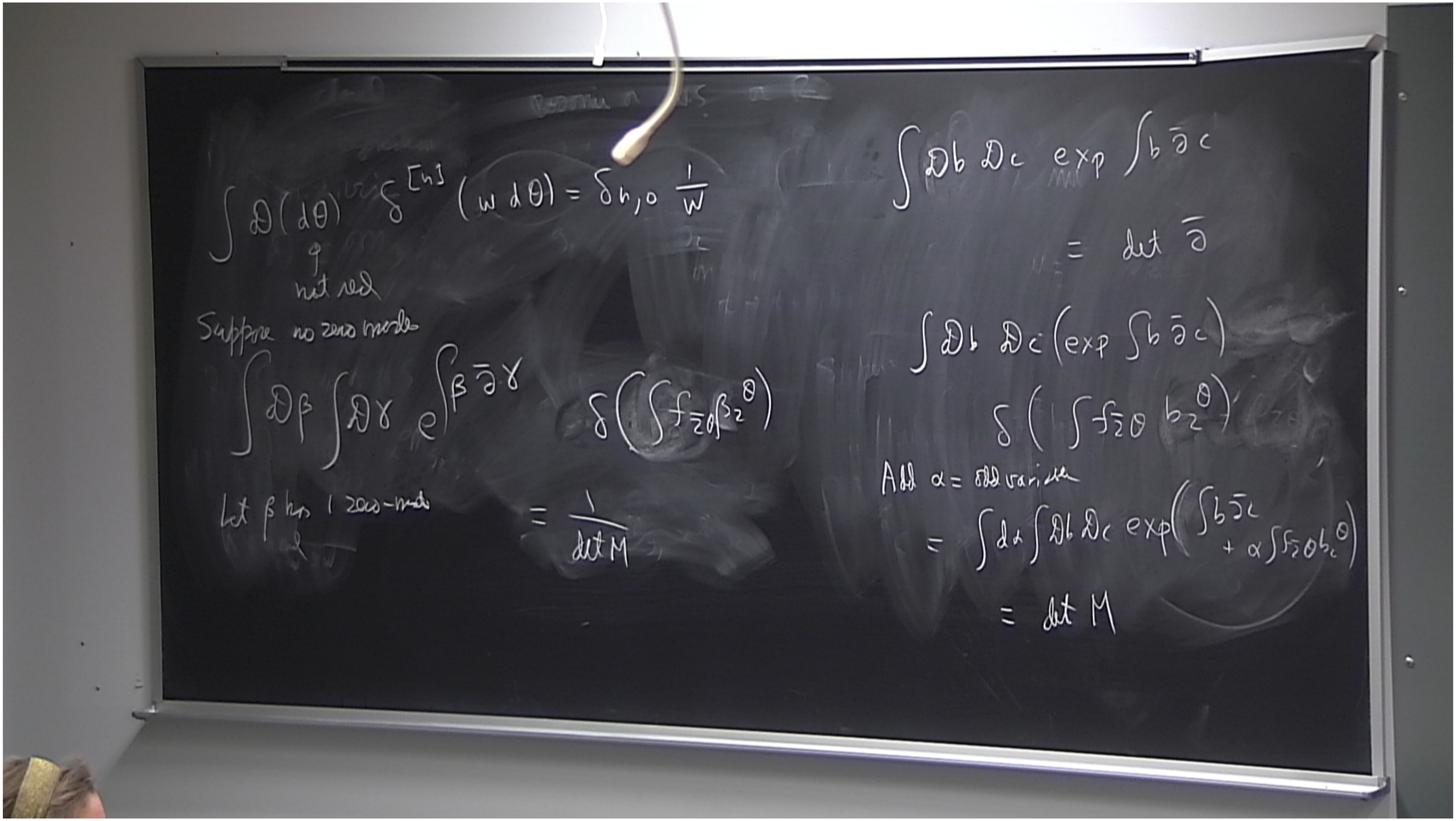

Bosonic String
If one wants a conformal formalism
vertex op θ must be annihilated
by b_n, n ≥ 0
b · θ only a single pole
Insertion c not ∂c, ∂²c, ...
∫ μ_z̄^z b_zz
μ_z̄^z → μ_z̄^z + ∂_z̄ f^z
f^z = 0 at position of θ
∫ ∂_z̄ f^z b_zz
→ ∫ f^z ∂_z̄ b_zz
Gauge inv
θ ≃ θ + QW


SUSY
bn θ = βr θ = 0 n, r ≥ 0
NS vertex op shift dim by 1/1
must have g.n. 0 & picture # −1
degree
S0 θ = c δ(γ) Vmatter = δ(c) δ(γ) Vmatter = δ'''(C) Vmatter
Integrate on n|m
degree n − m
g.n. −m
C = c + θγ
θ ≃ θ + QW
b z z
∂z̄ b z z




$\int \mathcal{D}(d\theta)\, \delta^{[n]}(w\, d\theta) = \delta_{n,0}\, \frac{1}{W}$
not real
Suppose no zero modes
$\int \mathcal{D}\beta \int \mathcal{D}\gamma\; e^{\int \beta \bar\partial \gamma} = \frac{1}{\det \bar\partial}$
$\int \mathcal{D}b\, \mathcal{D}c\; \exp \int b \bar\partial c$
$= \det \bar\partial$


$\int \mathcal{D}(d\theta)\ \delta^{[n]}(w\, d\theta) = \delta_{n,0}\frac{1}{W}$
not real
Suppose no zero modes
$\int \mathcal{D}\beta \int \mathcal{D}\gamma\ e^{\int \beta \bar\partial \gamma}$
$\delta\left(\int f_{\bar z}{}^{\theta} \beta_z{}^{\theta}\right)$
Let β has 1 zero-mode
$\int \mathcal{D}b\, \mathcal{D}c\ \exp \int b \bar\partial c$
$= \det \bar\partial$
$\int \mathcal{D}b\, \mathcal{D}c \left(\exp \int b \bar\partial c\right)$


∫ D(dθ) δ^[n] (w dθ) = δ_{n,0} 1/W
not red
Suppose no zero modes
∫Dβ ∫Dγ e^{∫β ∂̄ γ}
δ(∫f_z̄ θ β_z^θ)
Let β has 1 zero-mode
= 1/det M
∫Db Dc exp ∫b ∂̄ c
= det ∂̄
∫Db Dc (exp ∫b ∂̄ c)
δ(∫f_z̄ θ b_z^θ)
Add α = odd variable
= ∫dα ∫Db Dc exp(∫b ∂̄ c + α∫f_z̄ θ b_z^θ)
= det M

No zero modes

$$\int \mathcal{D}\beta\, \mathcal{D}\gamma \left(\exp \int \beta \bar{\partial} \gamma\right) \quad \delta(\beta(p))\ \delta(\gamma(q))$$

$$\int \mathcal{D}b\, \mathcal{D}c \left(\exp \int \beta \bar{\partial} \gamma\right) \quad \delta(b(p))\ \delta(c(q)) = \int \mathcal{D}b\, \mathcal{D}c\, du\, dv\ \exp\left(\int b \bar{\partial} c\right.$$

$$\delta(b(p)) = b(p) \qquad c(q)$$

$$= (\det \bar{\partial})\ S(p,q)$$

No zero modes

$$\int \mathcal{D}\beta\, \mathcal{D}\gamma \left(\exp \int \beta \bar\partial \gamma\right) \quad \delta\big(\beta(p)\big)\ \delta\big(\gamma(q)\big) = \int \mathcal{D}\beta\, \mathcal{D}\gamma \ \exp \int \beta\bar\partial\gamma + u\, \gamma(q) + v\, \beta(p)\Big)$$

$$= \frac{1}{\det(\ )}$$

$$= \frac{1}{\det \bar\partial}\ \frac{1}{\delta(p,q)}$$

$$\int \mathcal{D}b\, \mathcal{D}c \left(\exp \int \beta \bar\partial \gamma\right) \quad \delta(b(p))\ \delta(c(q)) = \int \mathcal{D}b\, \mathcal{D}c\, du\, dv \ \exp\Big(\int b\bar\partial c + u\, c(q) + v\, b(p)\Big)$$

$$\delta(b(p)) = b(p) \qquad \delta(c(q)) = c(q)$$

$$= (\det \bar\partial)\ \delta(p,q)$$

$$= \det \left(\begin{array}{c|c} \bar\partial & \delta(z-q) \\ \hline \delta(z-p) & 0 \end{array}\right)$$