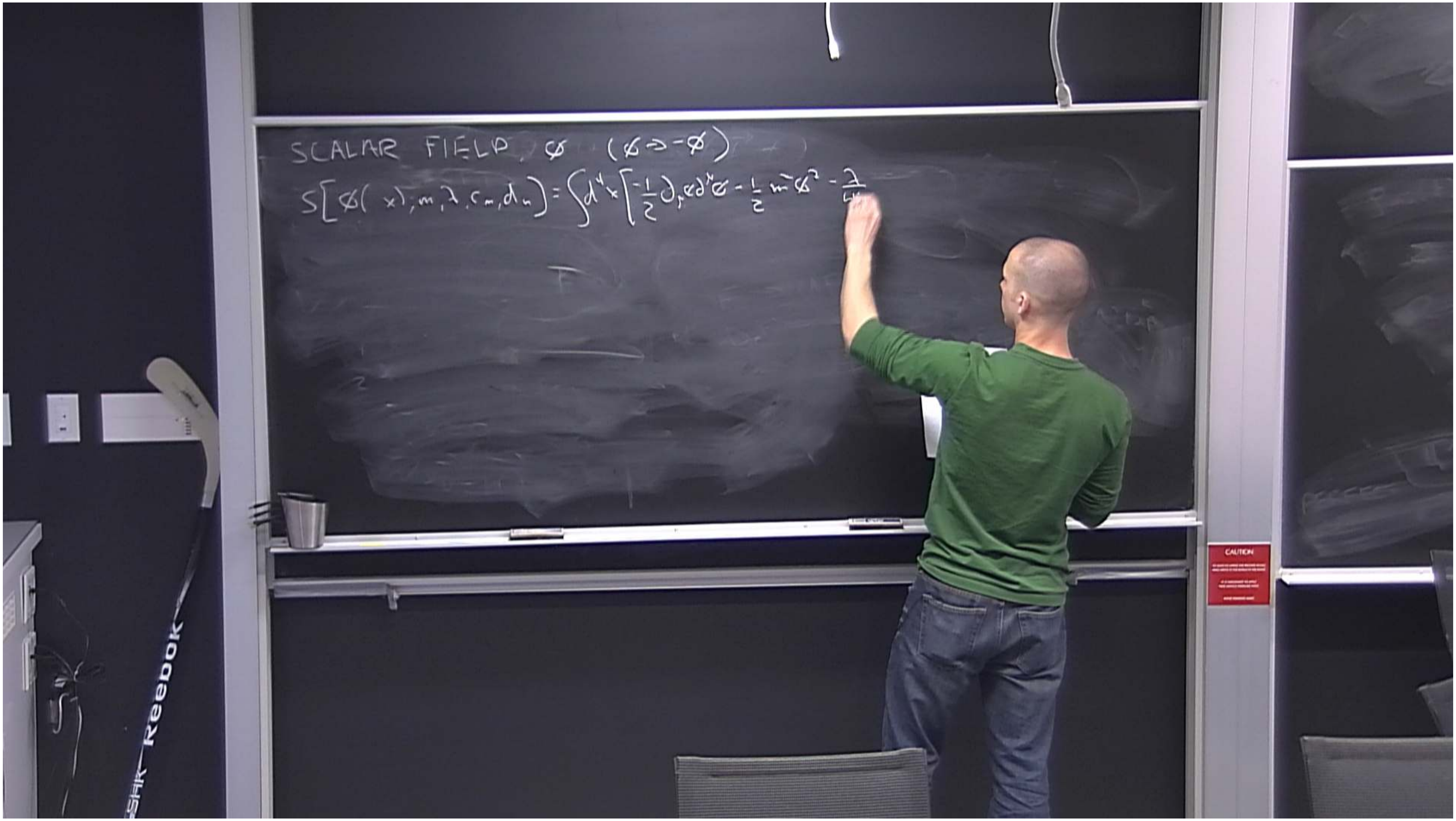
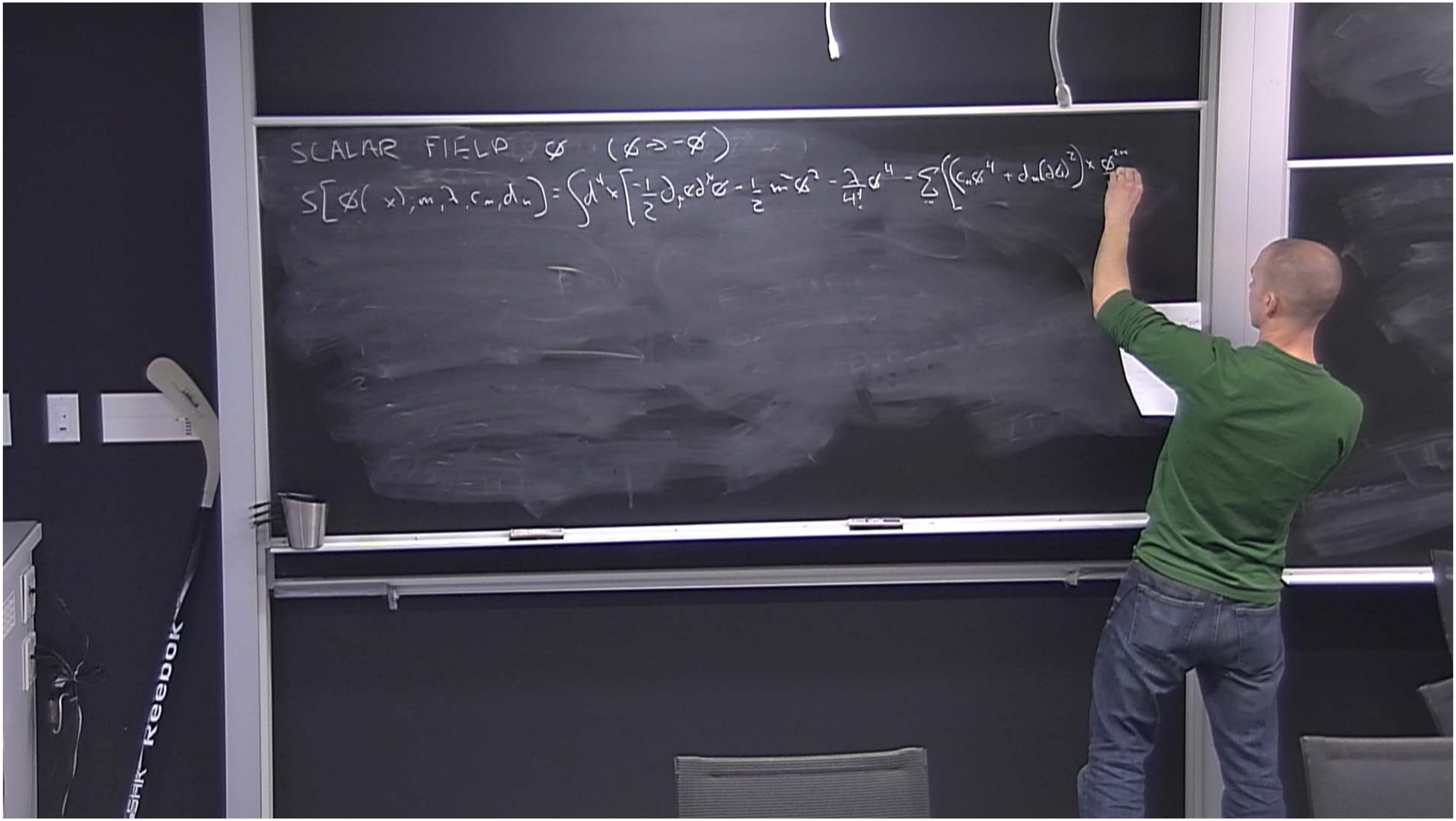
Title: Introduction to Effective Field Theories - Lecture 20

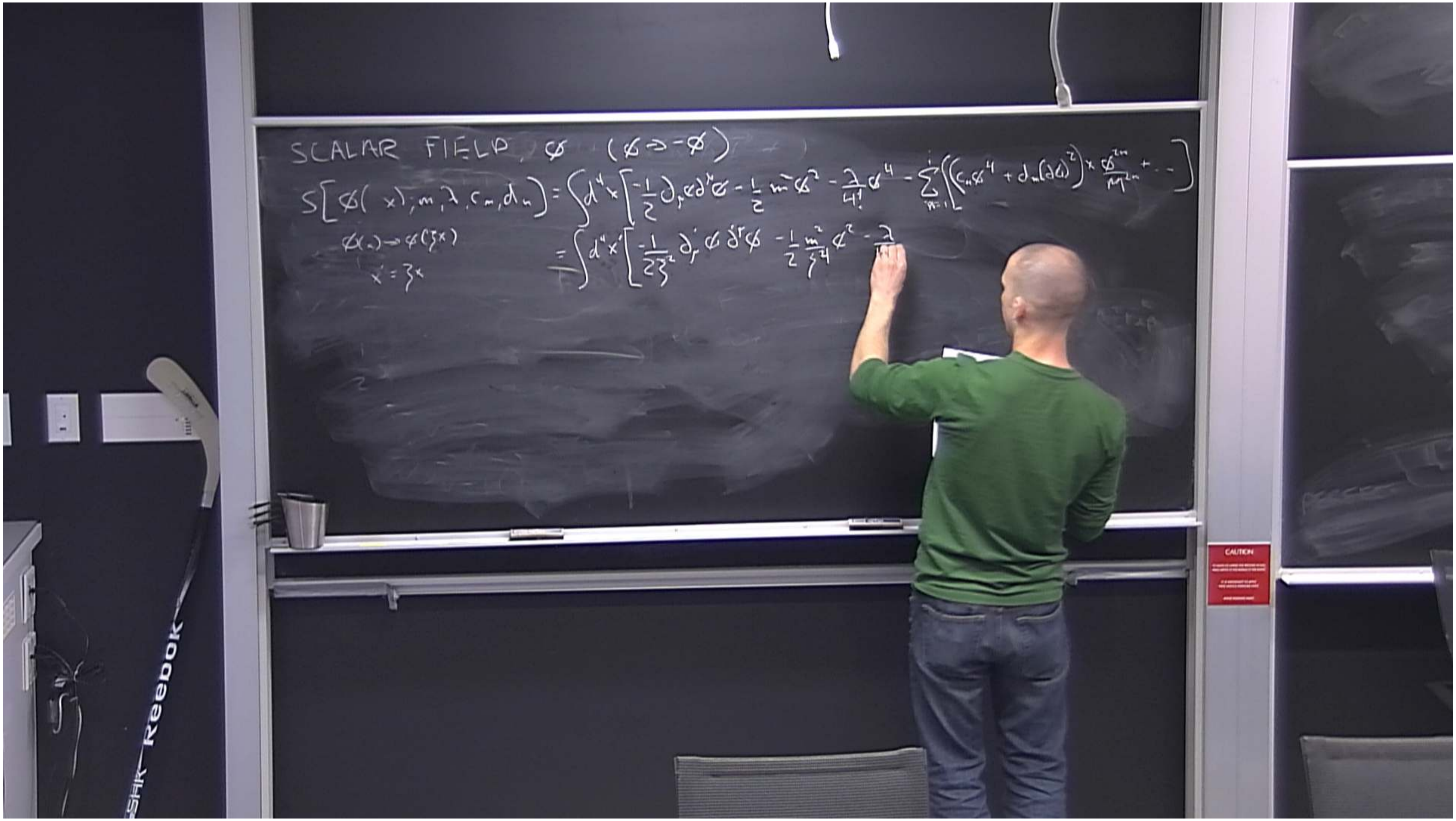
Date: Mar 28, 2014 02:30 PM

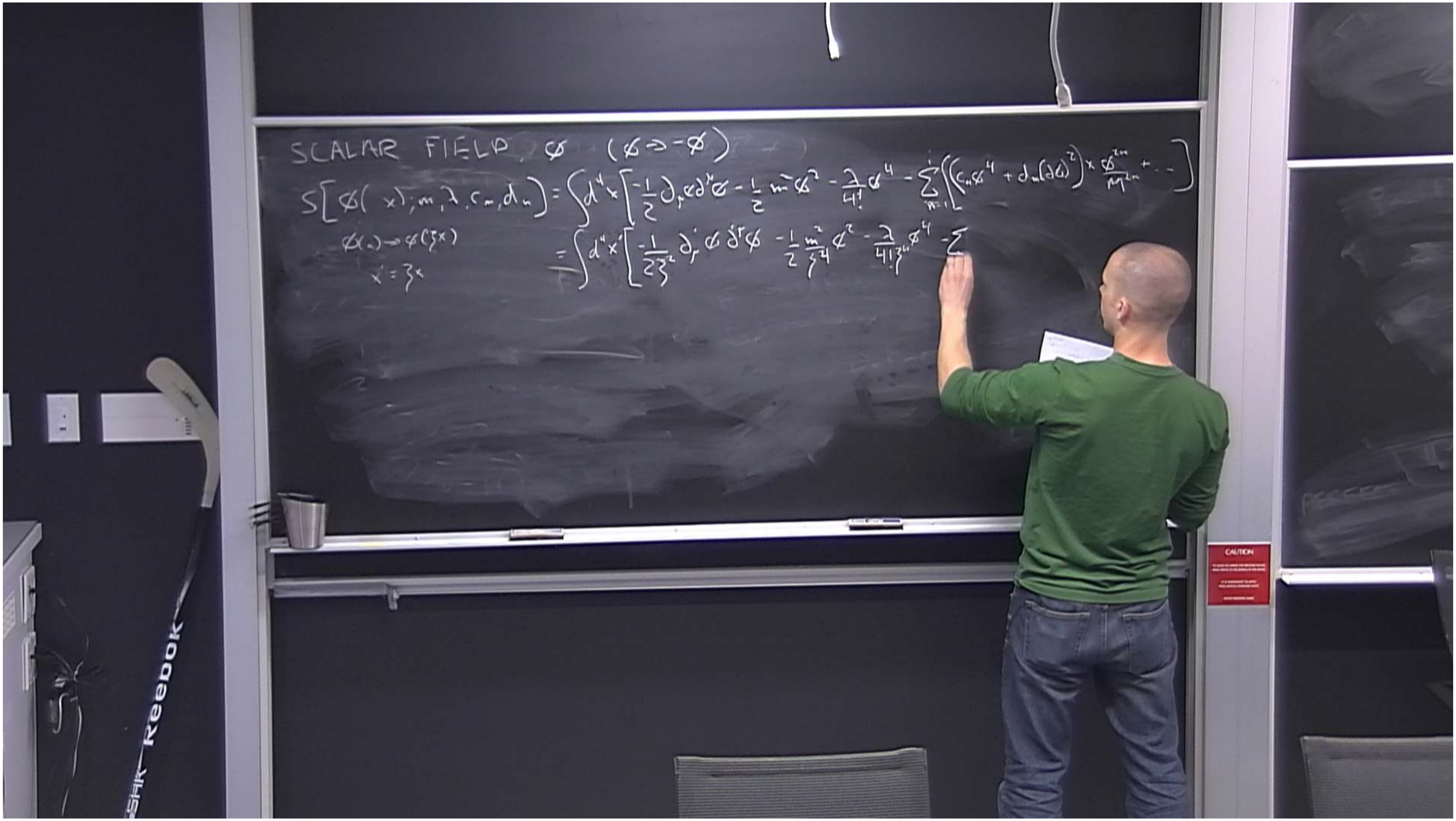
URL: http://pirsa.org/14030080

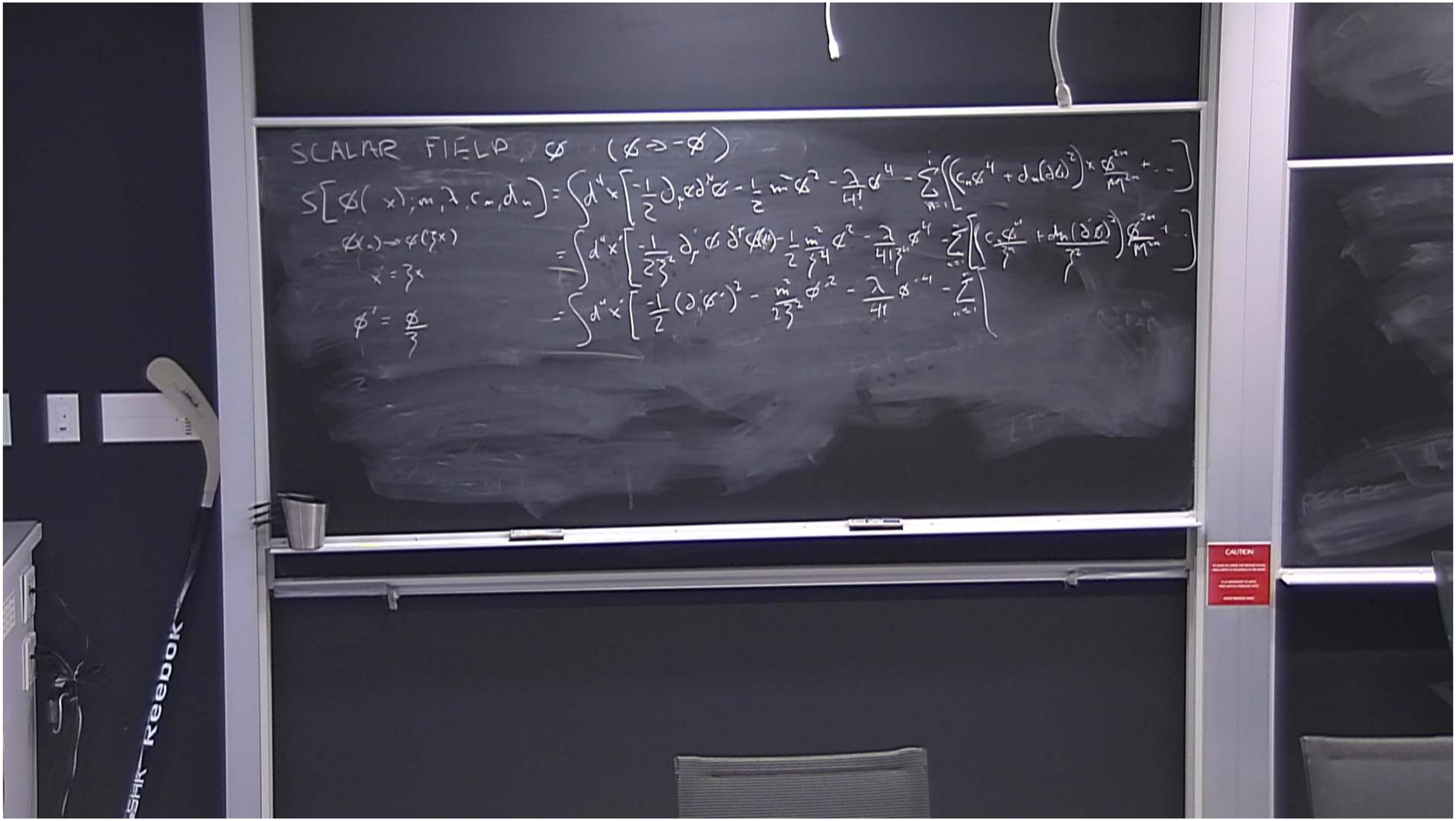
Abstract:

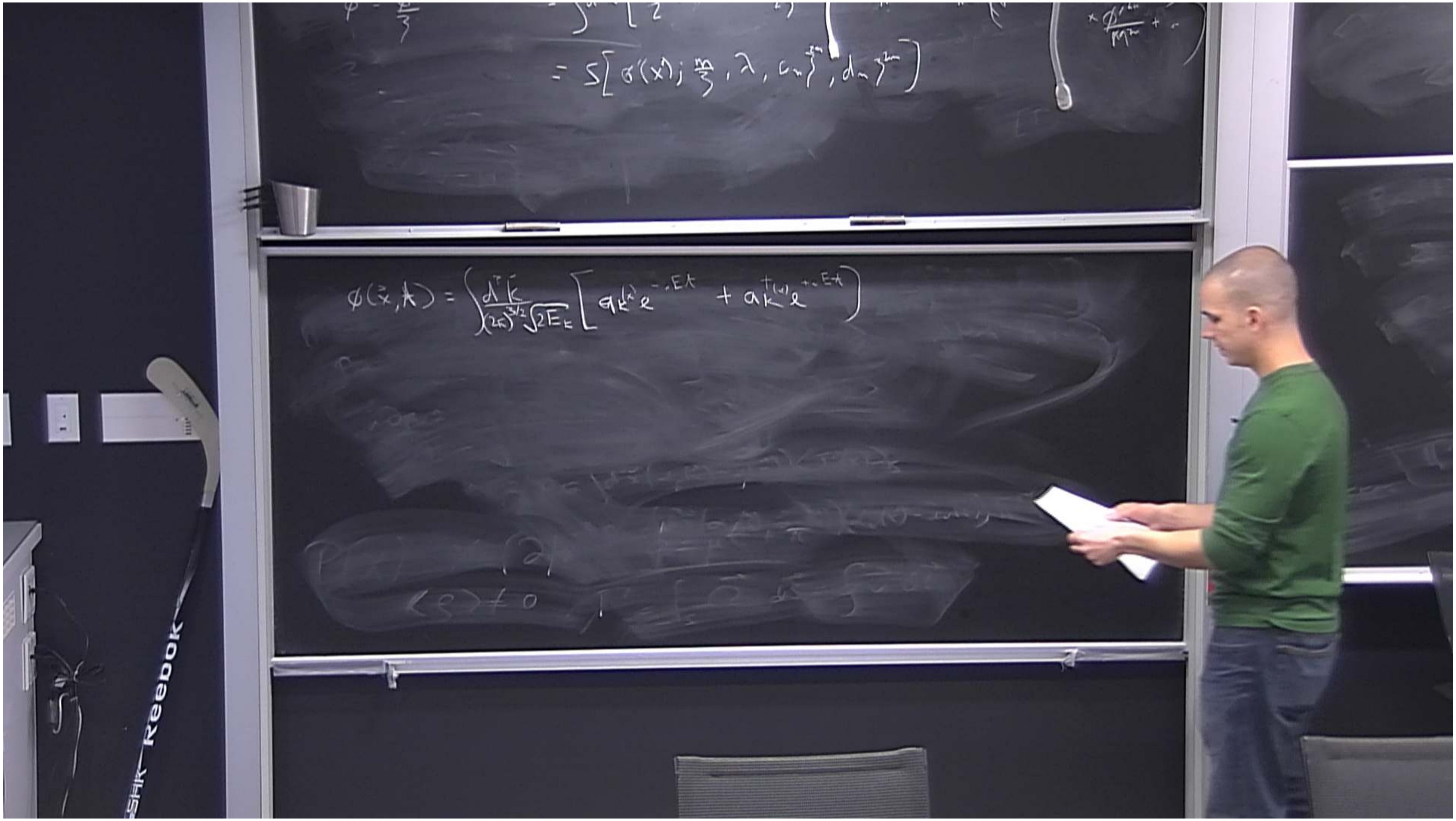

SCALAR FIELD, ϕ ($\phi \to -\phi$)
$S[\phi(x); m, \lambda, c_n, d_n] = \int d^4x \left[-\frac{1}{2} \partial_\mu \phi \partial^\mu \phi - \frac{1}{2} m^2 \phi^2 - \frac{\lambda}{4!}\right.$

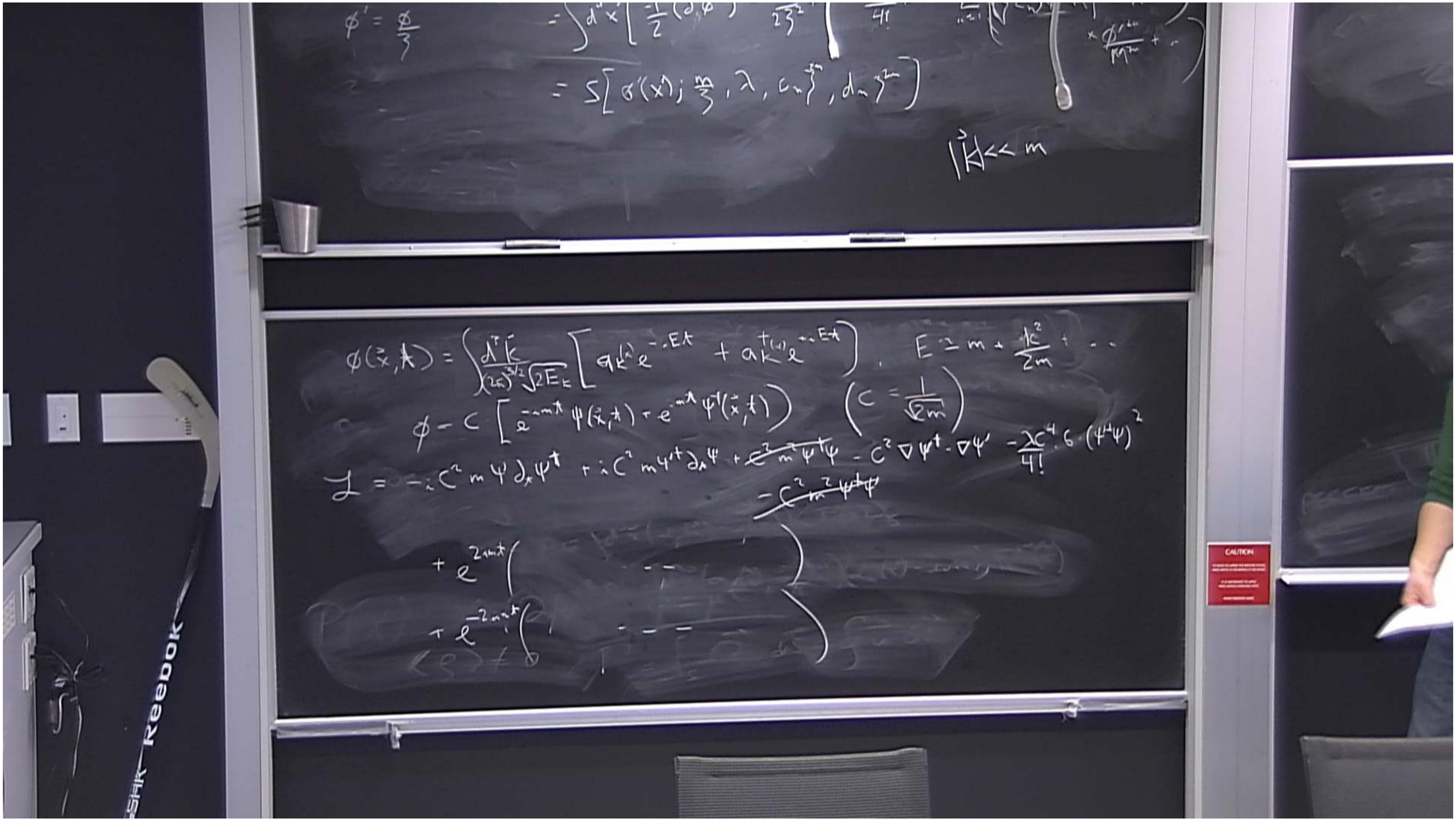

SCALAR FIELD, ϕ $(\phi \to -\phi)$
$S[\phi(x); m, \lambda, c_n, d_n] = \int d^4x \left[-\frac{1}{2}\partial_\mu\phi\partial^\mu\phi - \frac{1}{2}m^2\phi^2 - \frac{\lambda}{4!}\phi^4 - \sum_n \left[\left(c_n\phi^4 + d_n(\partial\phi)^2 \right) \times \phi^{2n} \right.\right.$
Reebok

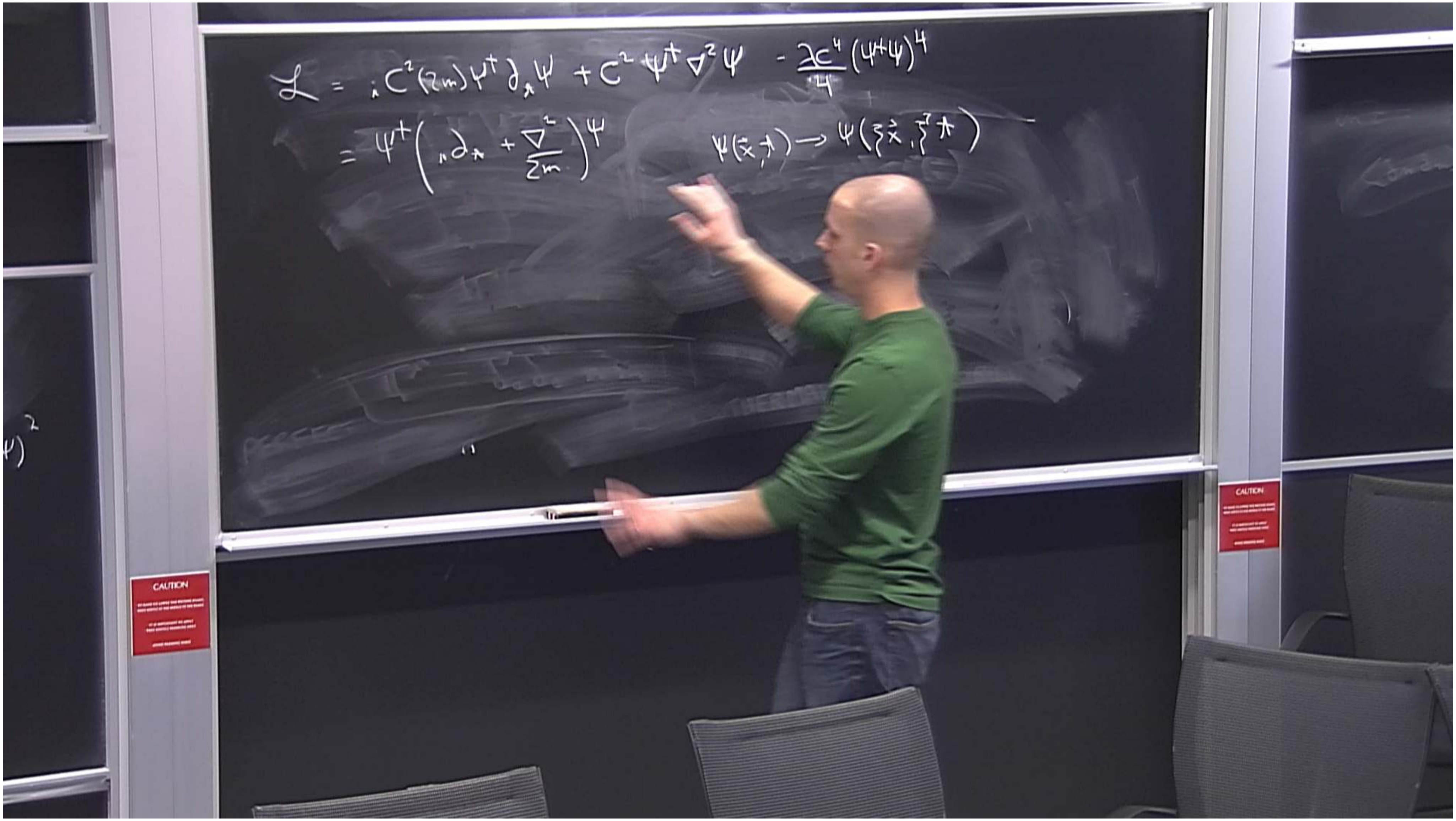

SCALAR FIELD, ϕ (ϕ → −ϕ)
Reebok
CAUTION

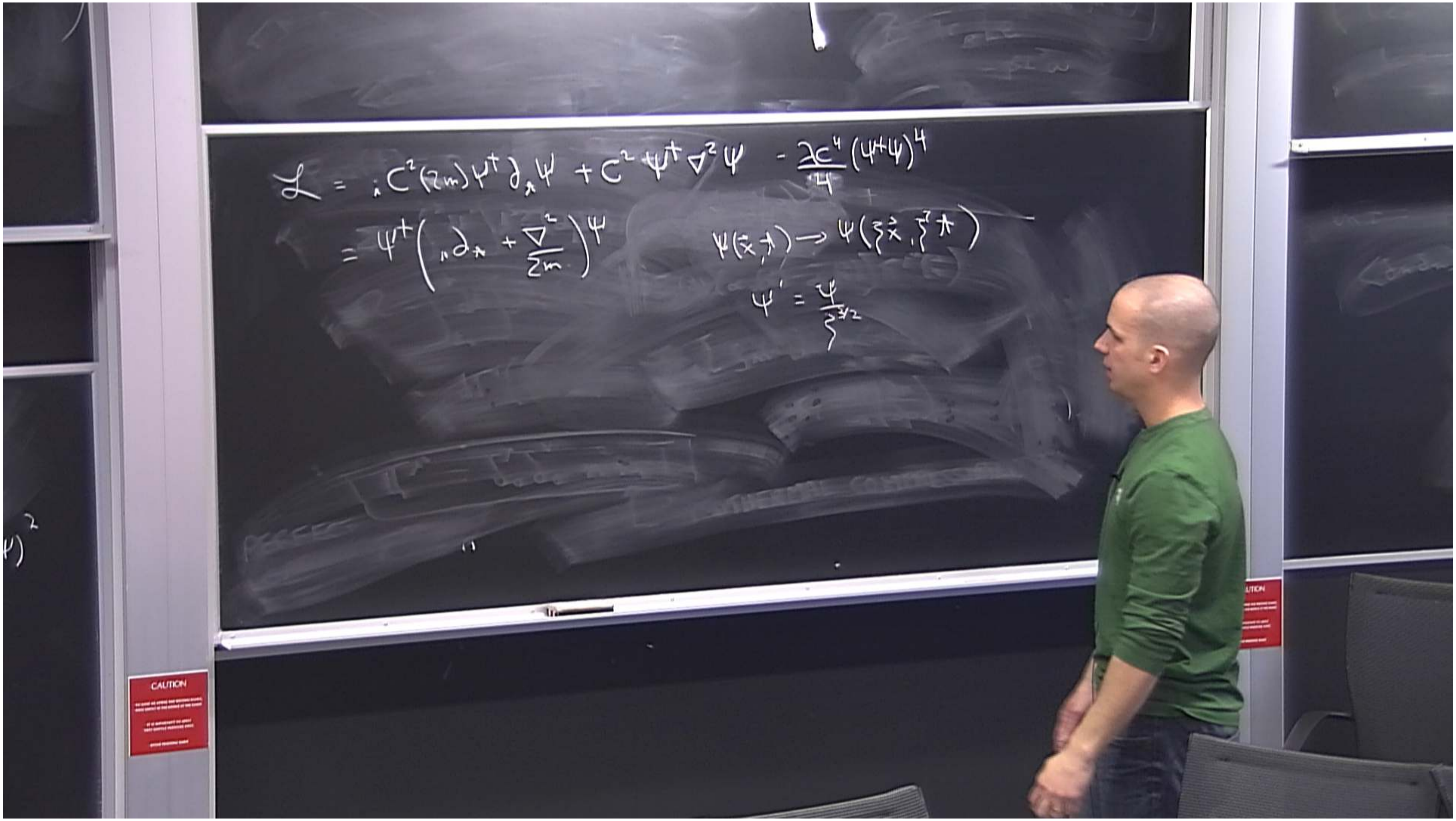

SCALAR FIELD, ϕ (ϕ → −ϕ)
x' = ζx

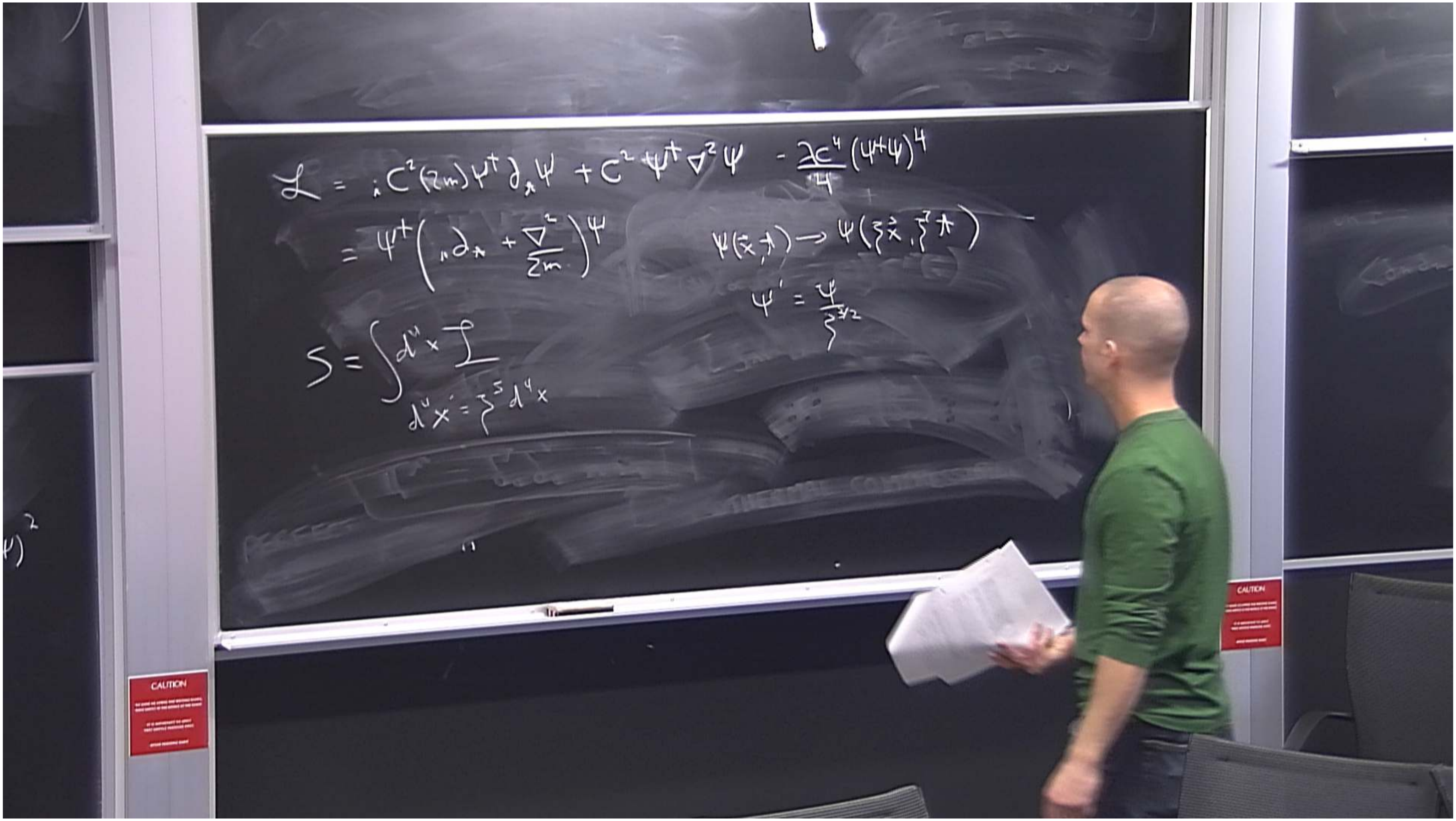

SCALAR FIELD, ϕ (ϕ → -ϕ)
ϕ(x) → ϕ(ζx)
x' = ζx
ϕ' = ϕ/ζ


$\phi(\vec{x},t) = \int \frac{d^3k}{(2\pi)^{3/2}\sqrt{2E_k}} \left[a_k e^{-iEt} + a_k^{\dagger} e^{+iEt} \right]$


= S[σ'(x'); m/ξ, λ, c_n ξ^{n}, d_n ξ^{2n}]
|k| << m
φ(x,t) = ∫ d³k / ((2π)^{3/2} √(2E_k)) [a_k e^{-iEt} + a_k^† e^{+iEt}], E = m + k²/2m + ...
φ = c [e^{-imt} ψ(x,t) + e^{imt} ψ^†(x,t)] (c = 1/√(2m))
L = -i c² m ψ ∂_t ψ^† + i c² m ψ^† ∂_t ψ - c² ∇ψ^† · ∇ψ - λc⁴/4! · 6 · (ψ^†ψ)²
+ e^{2imt}(---)
+ e^{-2imt}(---)


$\mathcal{L} = i c^2 (2m) \psi^\dagger \partial_t \psi + c^2 \psi^\dagger \nabla^2 \psi - \frac{\lambda c^4}{4} (\psi^\dagger \psi)^4$
$= \psi^\dagger \left(i \partial_t + \frac{\nabla^2}{2m} \right) \psi$
$\psi(\vec{x}, t) \to \psi(\xi \vec{x}, \xi^z t)$


$\mathcal{L} = i C^2 (2m) \psi^\dagger \partial_t \psi + C^2 \psi^\dagger \nabla^2 \psi - \frac{\lambda c^4}{4} (\psi^\dagger \psi)^4$
$= \psi^\dagger \left(i\partial_t + \frac{\nabla^2}{2m} \right) \psi$
$\psi(\vec{x}, t) \to \psi(\xi \vec{x}, \xi^2 t)$
$\psi' = \frac{\psi}{\xi^{3/2}}$
CAUTION


L = i C² (2m) ψ† ∂t ψ + C² ψ† ∇² ψ - λc⁴/4 (ψ†ψ)⁴
= ψ† (i∂t + ∇²/2m) ψ
ψ(x, t) → ψ(ξx, ξ²t)
ψ' = ψ/ξ^3/2
S = ∫d⁴x L
d⁴x' = ξ⁵ d⁴x
CAUTION
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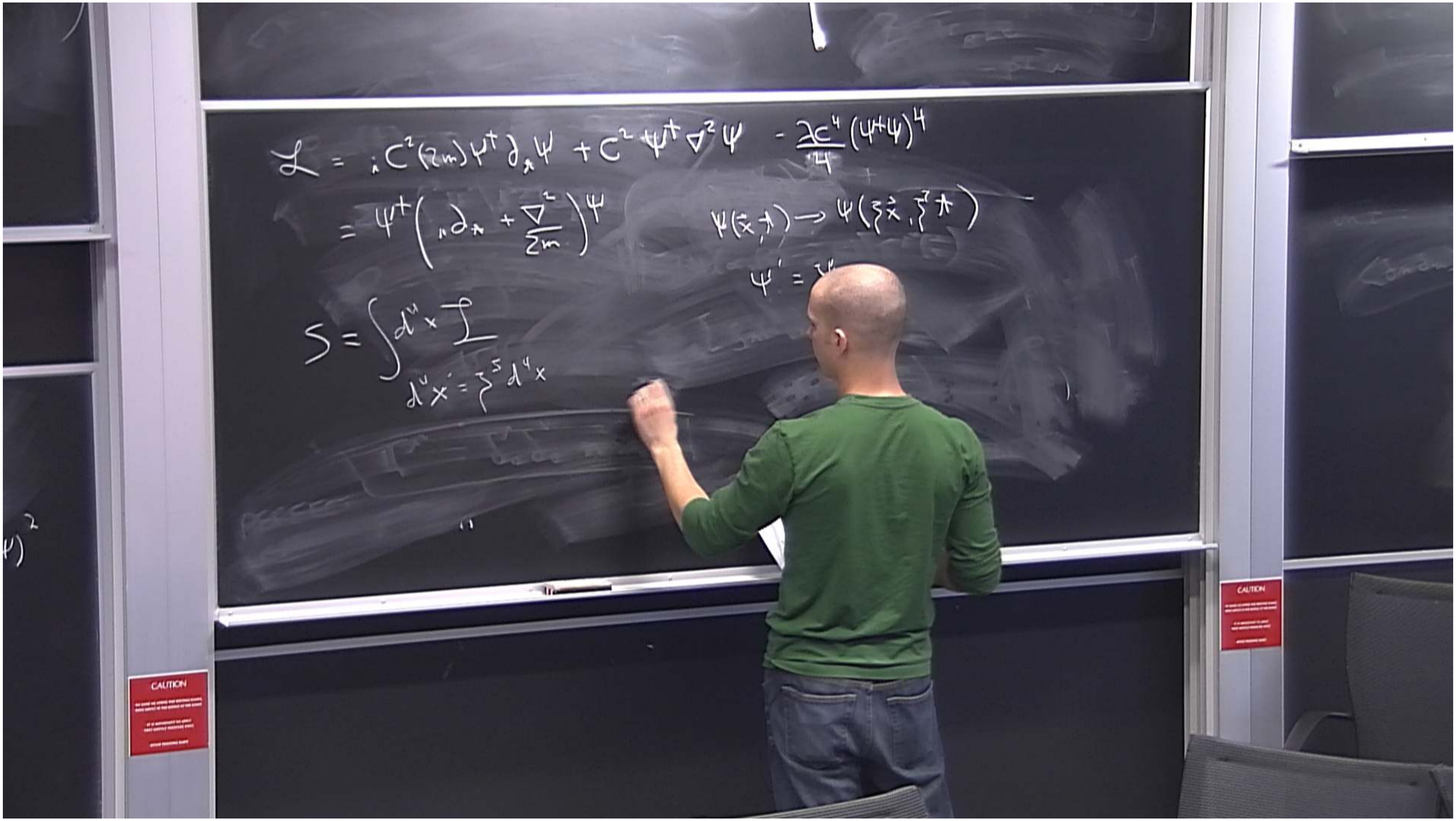
S = ∫d^4x L
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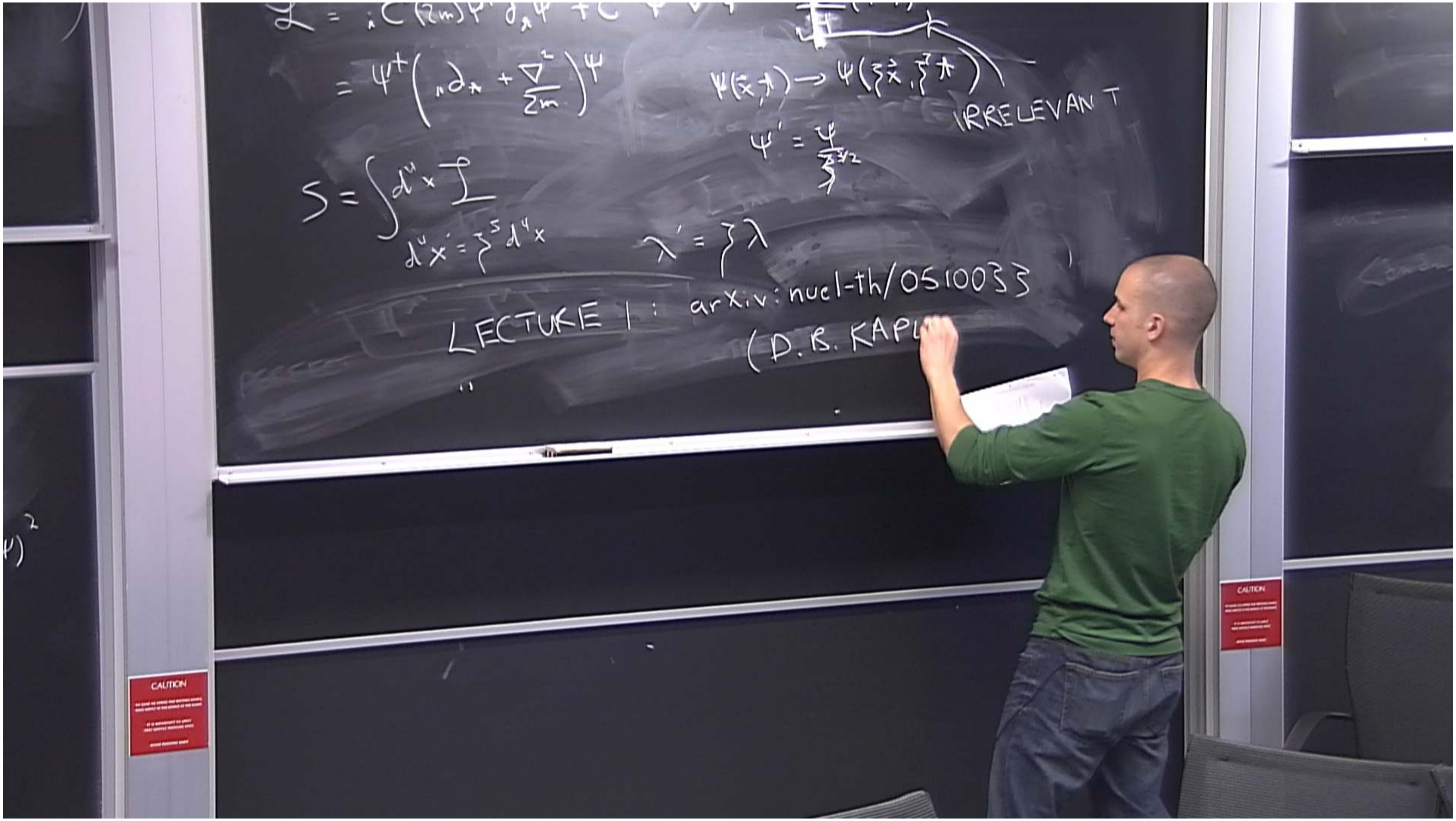
IRRELEVANT
LECTURE 1 : arxiv: nucl-th/0510023
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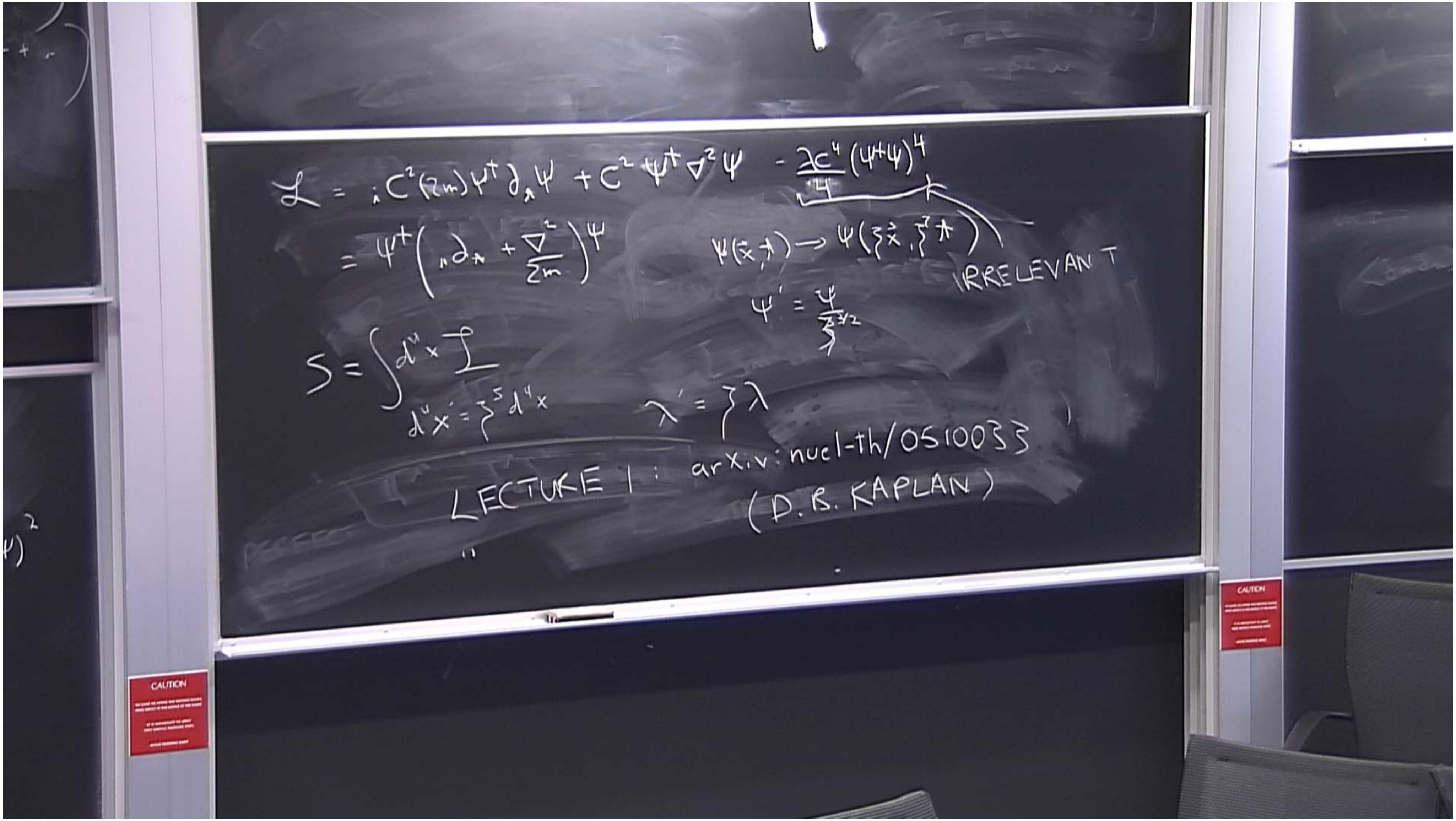
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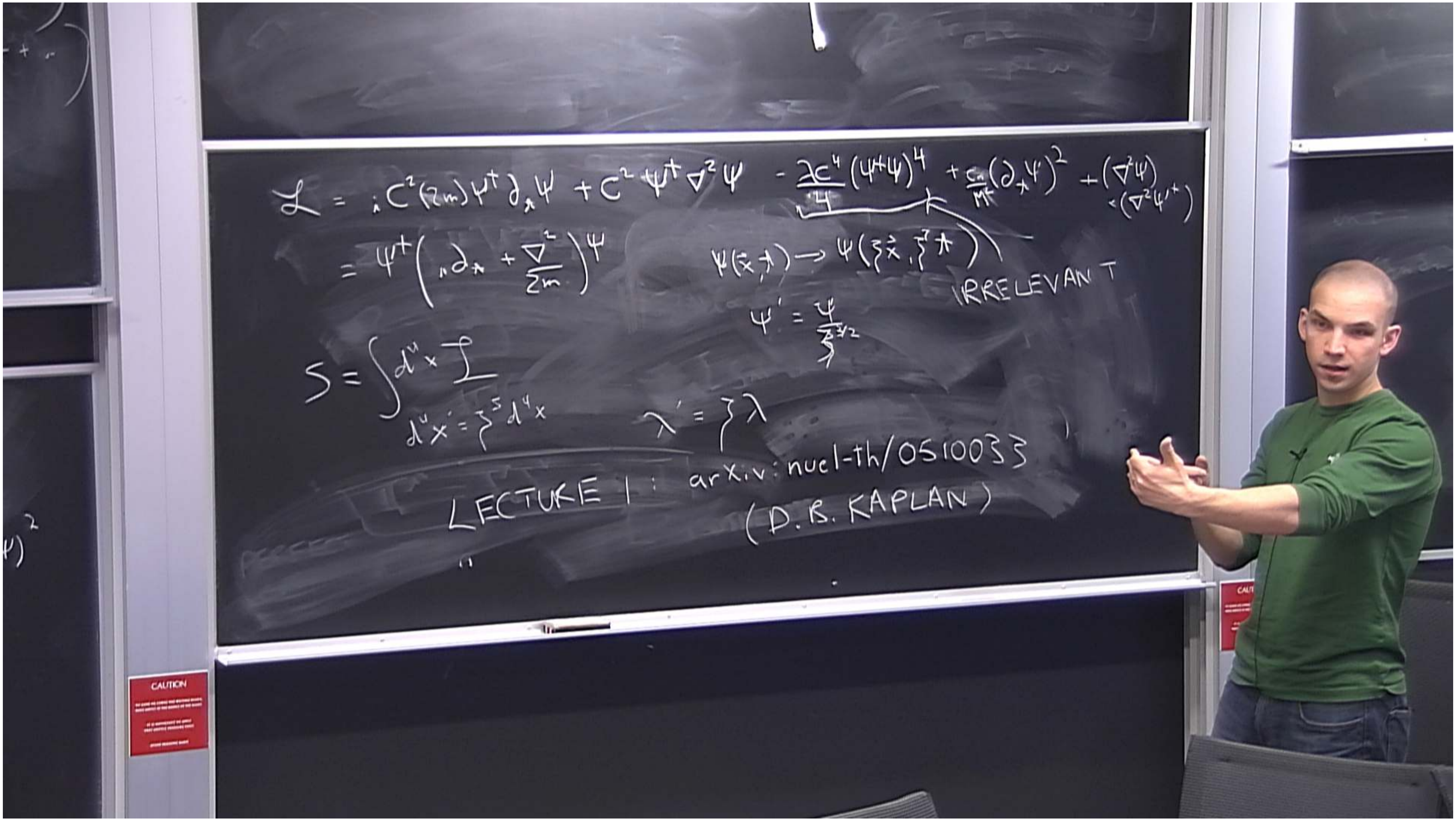
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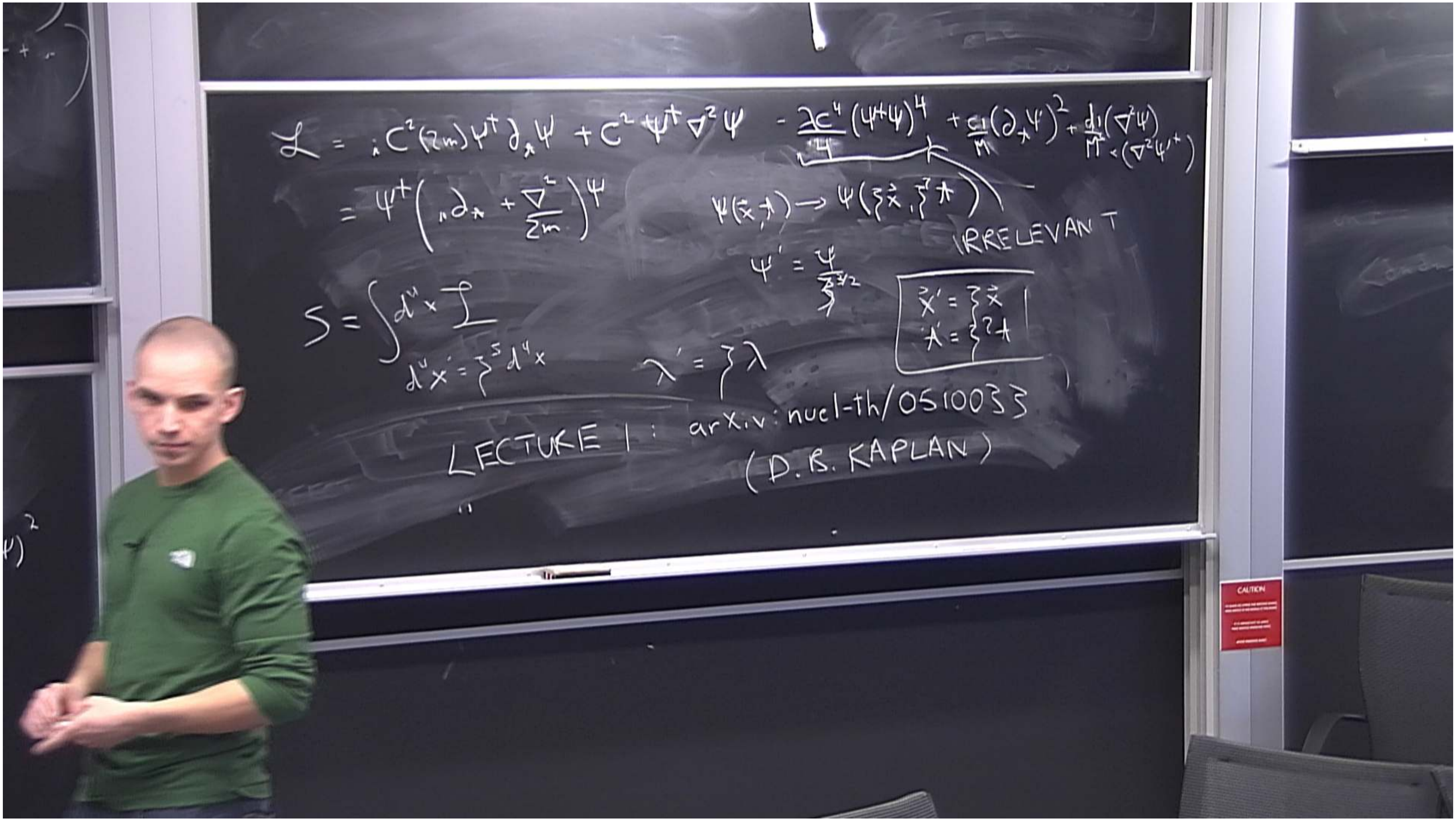
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