Title: Dictionaries and Wavefunctions in dS/CFT and AdS/CFT

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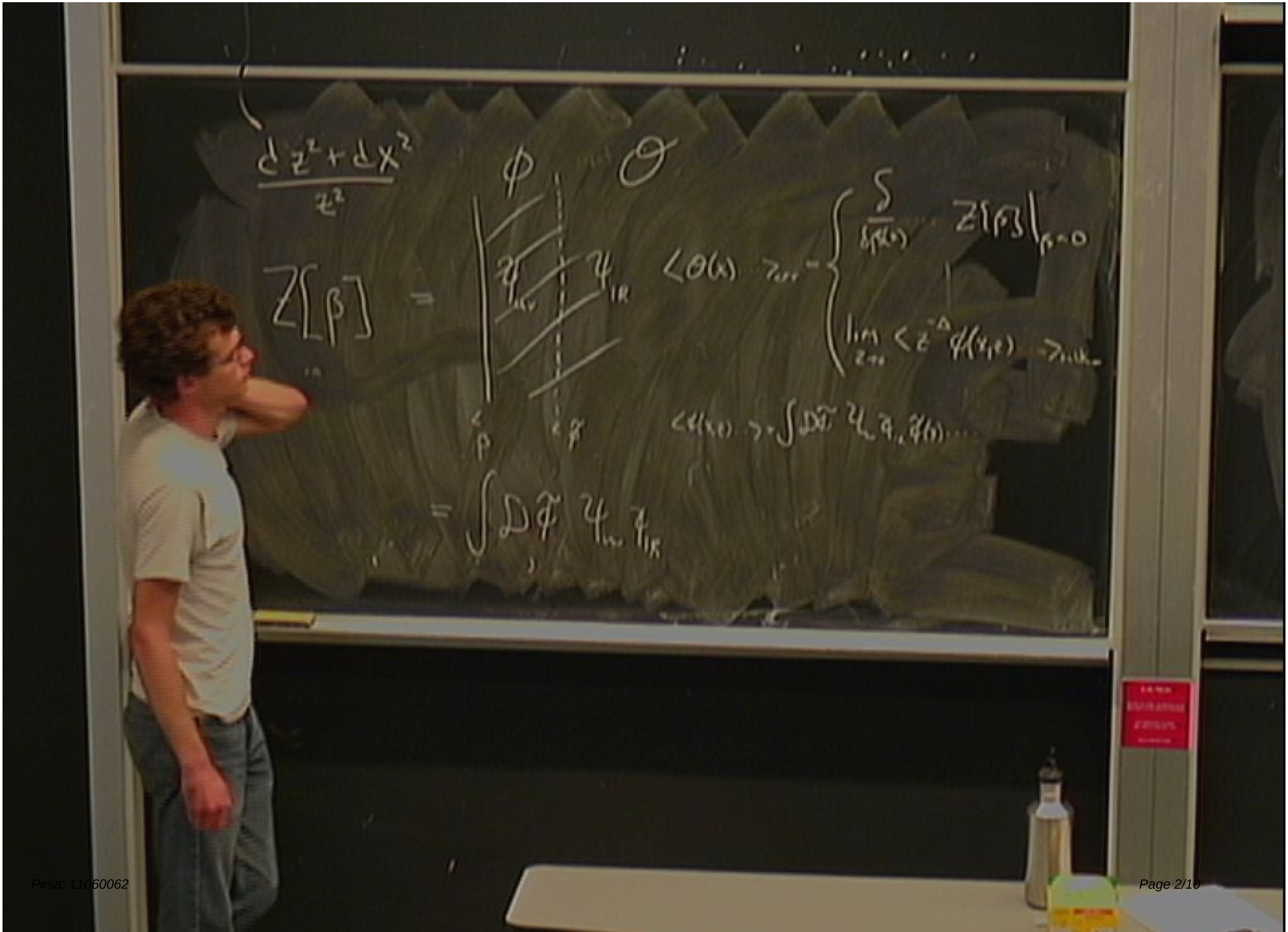
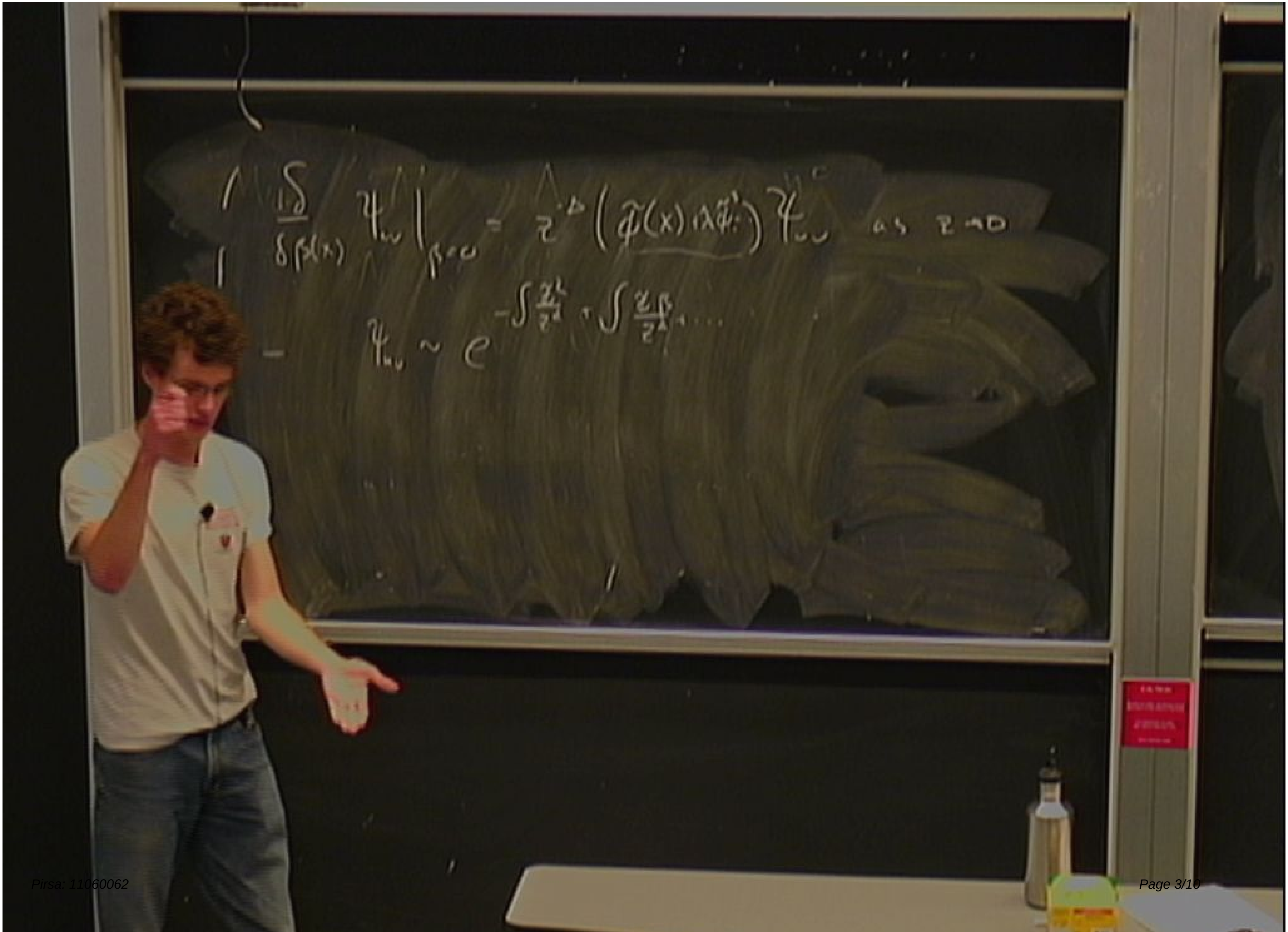
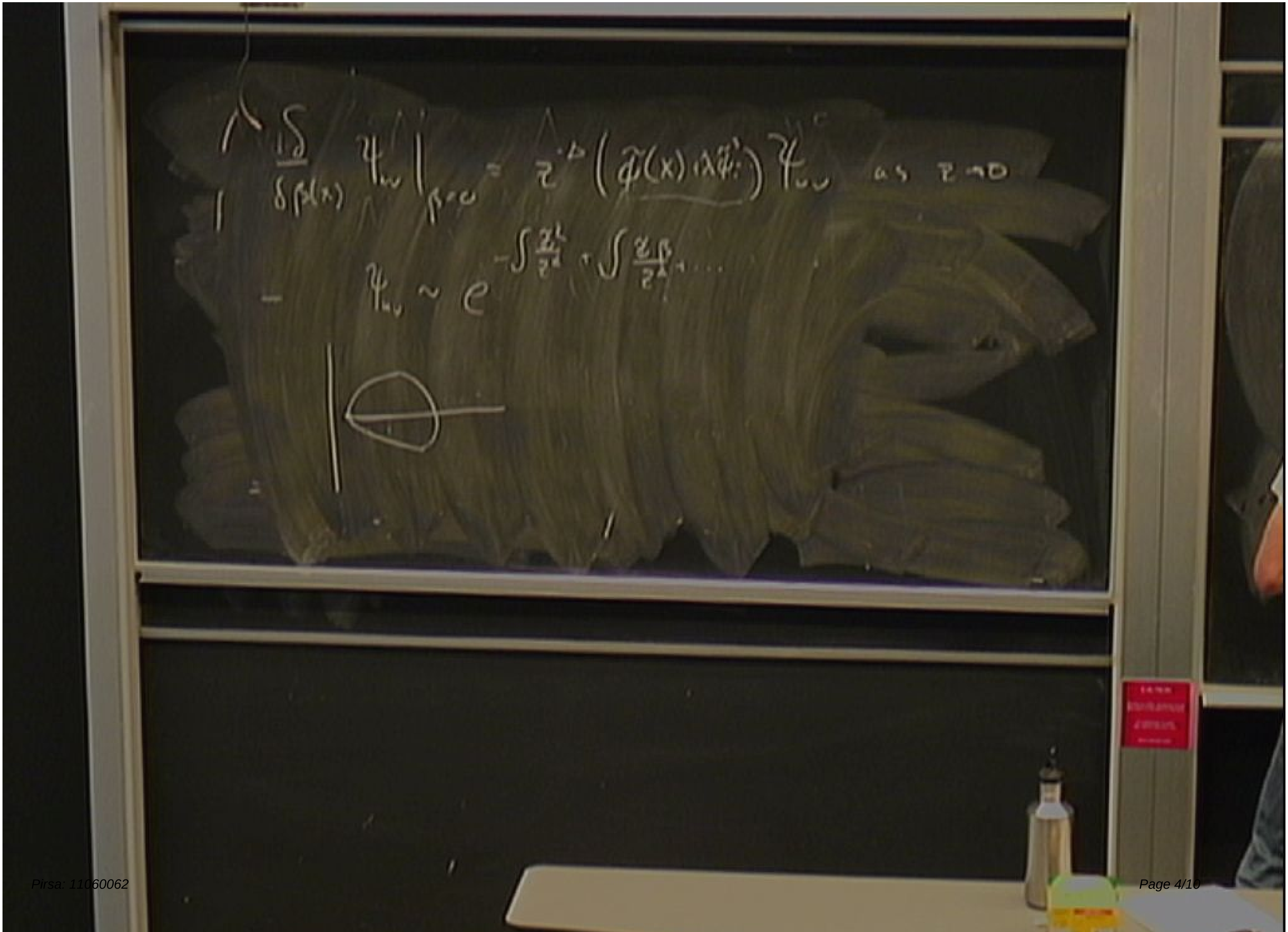
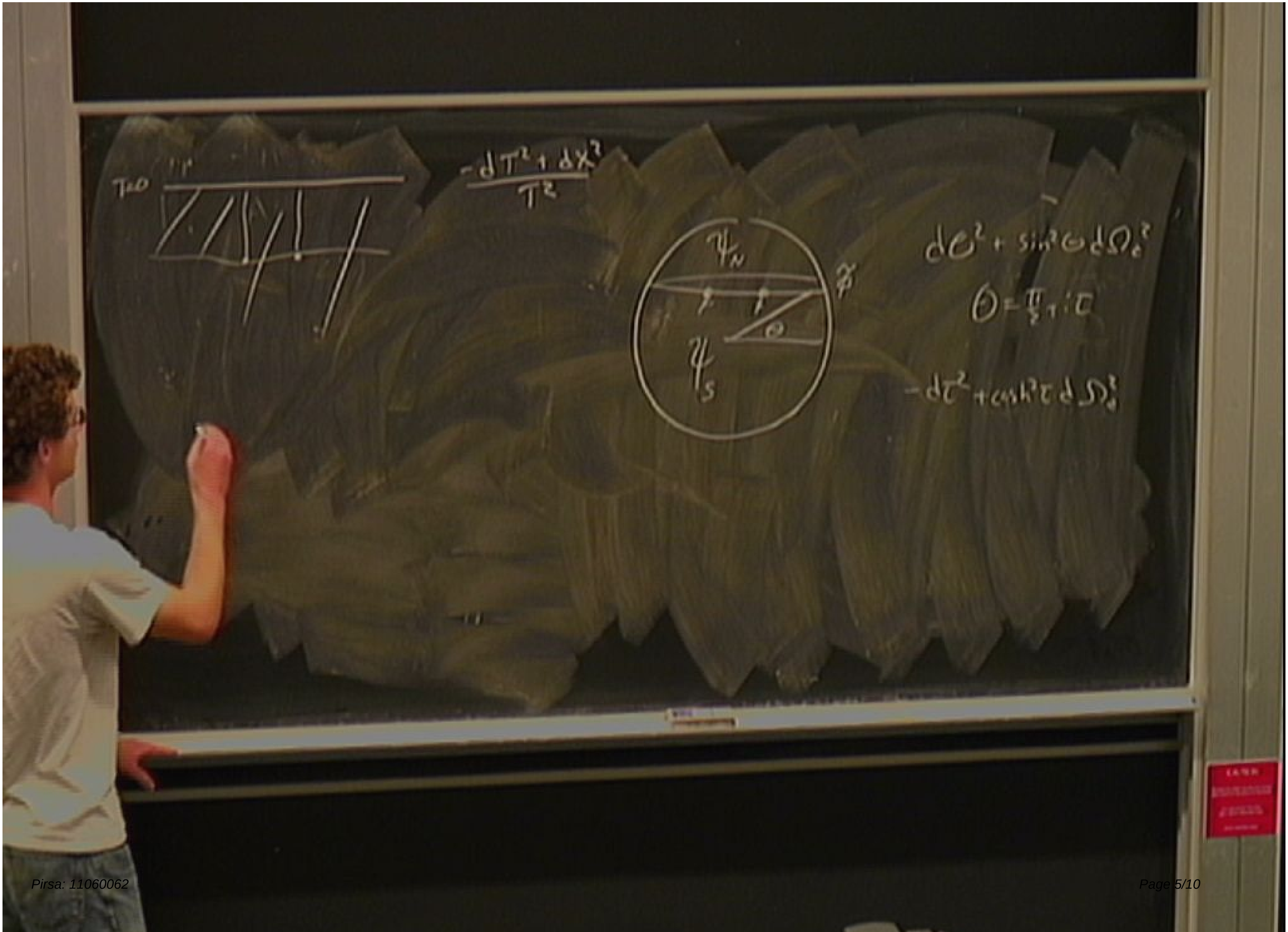
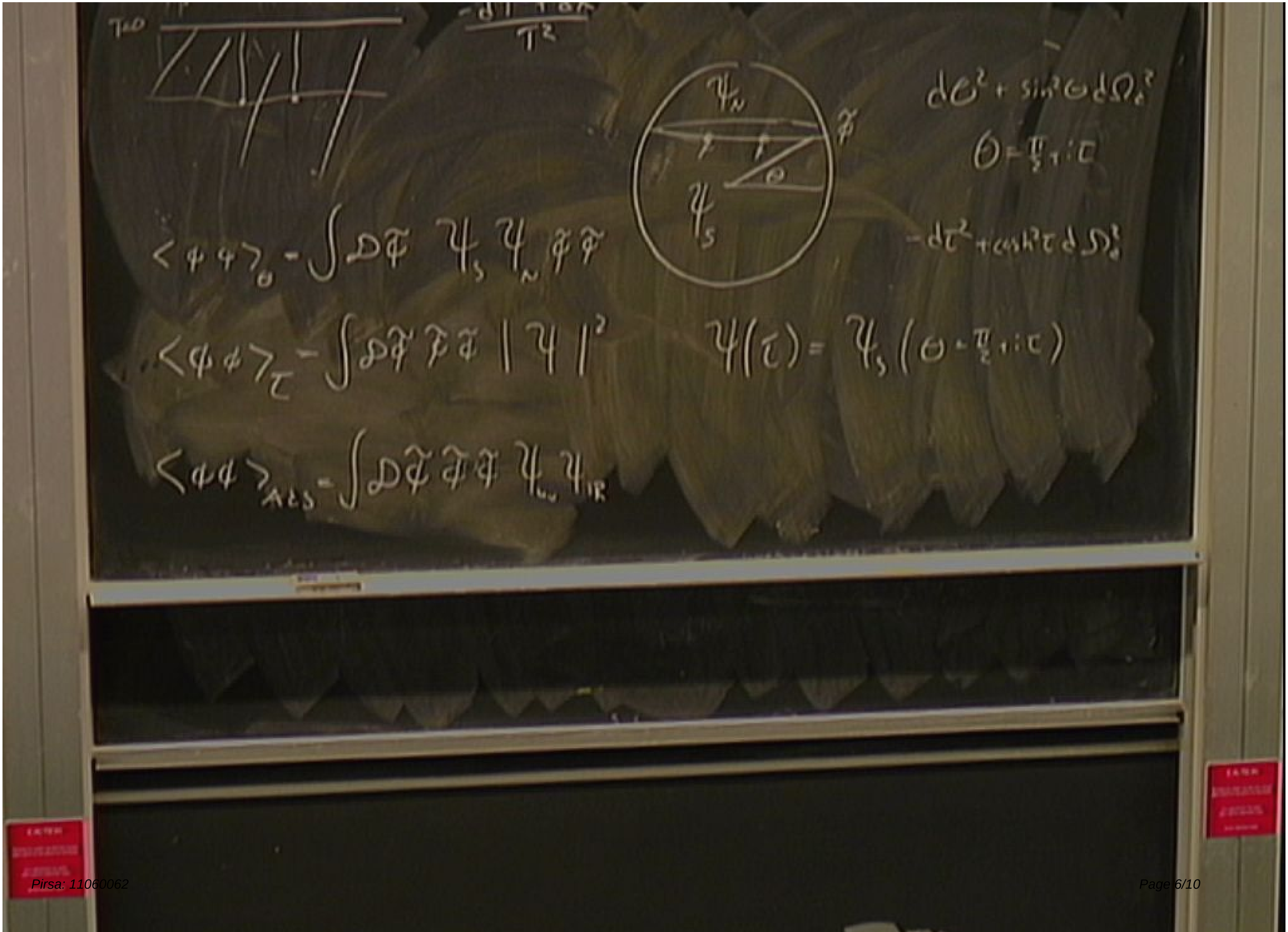
Abstract: I discuss bubble collisions from the perspective of an observer in a hat. In particular, I emphasize the breaking and restoration of conformal symmetry, as well as (independence of) initial conditions and rate equations. A cartoon version of the problem, Mandelbrot percolation, makes computations tractable. Enjoyable, even.

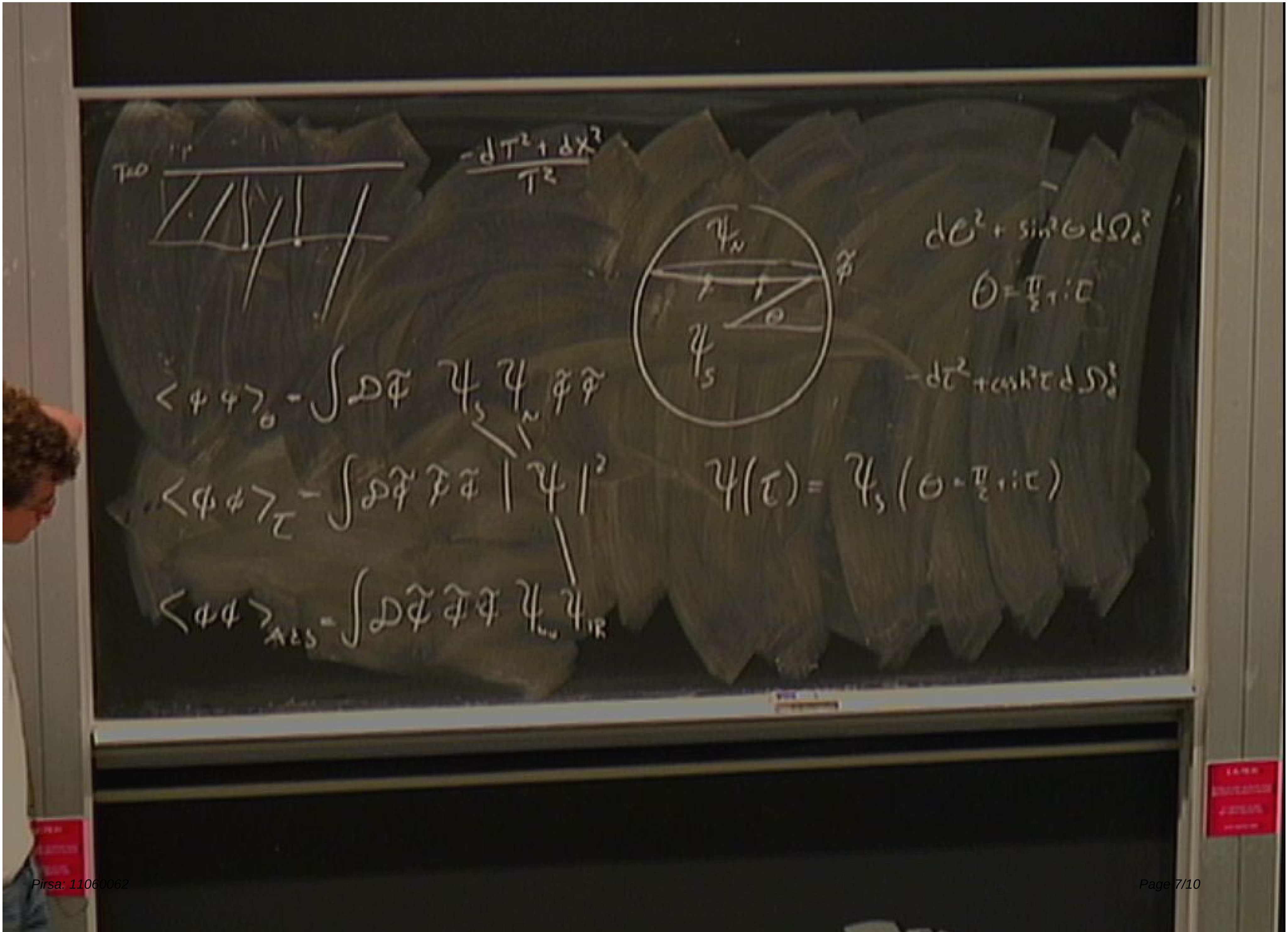





$\frac{1}{\delta}\frac{\delta}{\delta\beta(x)}\Psi_{WW}\Big|_{\beta=0} = z^{\Delta}\left(\Phi(x)\,\lambda\Phi\right)\Psi_{WW}$ as $z \to 0$
$\Psi_{WW} \sim e^{-\int\frac{\phi^2}{z^d}+\int\frac{z\beta}{z^\Delta}+\cdots}$


$\frac{-d\tau^2 + dx^2}{\tau^2}$
$d\theta^2 + \sin^2\theta\, d\Omega^2$
$\theta = \frac{\pi}{2} + i\tau$
$-d\tau^2 + \cosh^2\tau\, d\Omega^2$
θ


ψ_N
ψ_S
θ
ϕ
$d\theta^2 + \sin^2\theta \, d\Omega_d^2$
$\theta = \frac{\pi}{2} + i\tau$
$-d\tau^2 + \cosh^2\tau \, d\Omega_d^2$
$\langle \phi \phi \rangle_\theta = \int \mathcal{D}\phi \, \psi_S \psi_N \phi \phi$
$\langle \phi \phi \rangle_\tau = \int \mathcal{D}\phi \, \phi \phi \, |\psi|^2$
$\psi(\tau) = \psi_S(\theta = \frac{\pi}{2} + i\tau)$
$\langle \phi \phi \rangle_{AdS} = \int \mathcal{D}\phi \, \phi \phi \, \psi_{UV} \psi_{IR}$


$\frac{-dT^2 + dx^2}{T^2}$
Ψ_N
Ψ_S
θ
$\tilde{\phi}$
$d\theta^2 + \sin^2\theta \, d\Omega_d^2$
$\theta = \frac{\pi}{2} + i\tau$
$-d\tau^2 + \cosh^2\tau \, d\Omega_d^2$
$\langle \phi \phi \rangle_\theta = \int D\tilde{\phi} \; \Psi_S \Psi_N \tilde{\phi} \tilde{\phi}$
$\langle \phi \phi \rangle_\tau = \int D\tilde{\phi} \; \tilde{\phi} \tilde{\phi} \; |\Psi|^2$
$\Psi(\tau) = \Psi_S(\theta = \frac{\pi}{2} + i\tau)$
$\langle \phi \phi \rangle_{AdS} = \int D\tilde{\phi} \; \tilde{\phi} \tilde{\phi} \; \Psi_{UV} \Psi_{IR}$

$$\Psi_{UV} = e^{-\int \frac{\tilde{\phi}^2}{z^{\Delta}} - \int \frac{\tilde{\phi}_k \tilde{\phi}_{-k}\, k^{2\Delta-d}}{z^{2(\Delta-d)}} + \cdots}$$

$$\Psi_{IR} = e^{i\int \frac{\tilde{\phi}^2}{T^{\delta}} + (1+i)\int \frac{\tilde{\phi}_k \tilde{\phi}_{-k}\, k^{2\delta-d}}{T^{2(\delta-d)}} + \cdots}$$

$$\Psi = e$$

$$\frac{\delta}{\delta\tilde{\phi}_k}\frac{\delta}{\delta\tilde{\phi}_{-k}}\Psi\Big|_{\tilde{\phi}=0} \sim k^{2\delta-d} \qquad \langle \phi_k \phi_{-k}\rangle \sim \frac{1}{k^{2\delta-d}}$$

$$\delta \qquad\qquad d-\delta$$

$$\Psi[g,\tilde{\phi}] \text{ “=” } \int \mathcal{D}M \, e^{-S[M,g] + \tilde{\phi}\mathcal{O}}$$

$$\langle \Psi_2 \Psi_1 \rangle = \int \mathcal{D}\tilde{\phi} \, \mathcal{D}g \, \tilde{\phi}\tilde{\phi} \, \mathcal{D}M_1 \mathcal{D}M_2 \, e^{-S_1 - S_2 + \tilde{\phi}(\mathcal{O}_1 + \mathcal{O}_2)}$$

$$\langle\langle \mathcal{O}(x)\mathcal{O}(y)\rangle\rangle = \int \mathcal{D}\tilde{\phi}\; \psi^* \frac{\delta}{\delta\tilde{\phi}(x)}\frac{\delta}{\delta\tilde{\phi}(y)}\, \psi$$

$$\psi = \exp\left(\frac{1}{2} \langle \mathcal{O}(x)\mathcal{O}(y)\rangle\, \tilde{\phi}(x)\tilde{\phi}(y) + \cdots \right)$$

$$= \langle \mathcal{O}(x)\mathcal{O}(y)\rangle + \langle \mathcal{O}(x)\mathcal{O}(x')\rangle \langle\langle \tilde{\phi}(x')\tilde{\phi}(y')\rangle\rangle \langle \mathcal{O}(y')\mathcal{O}(y)\rangle$$

$$\langle \mathcal{O}(x)\mathcal{O}(y)\rangle$$