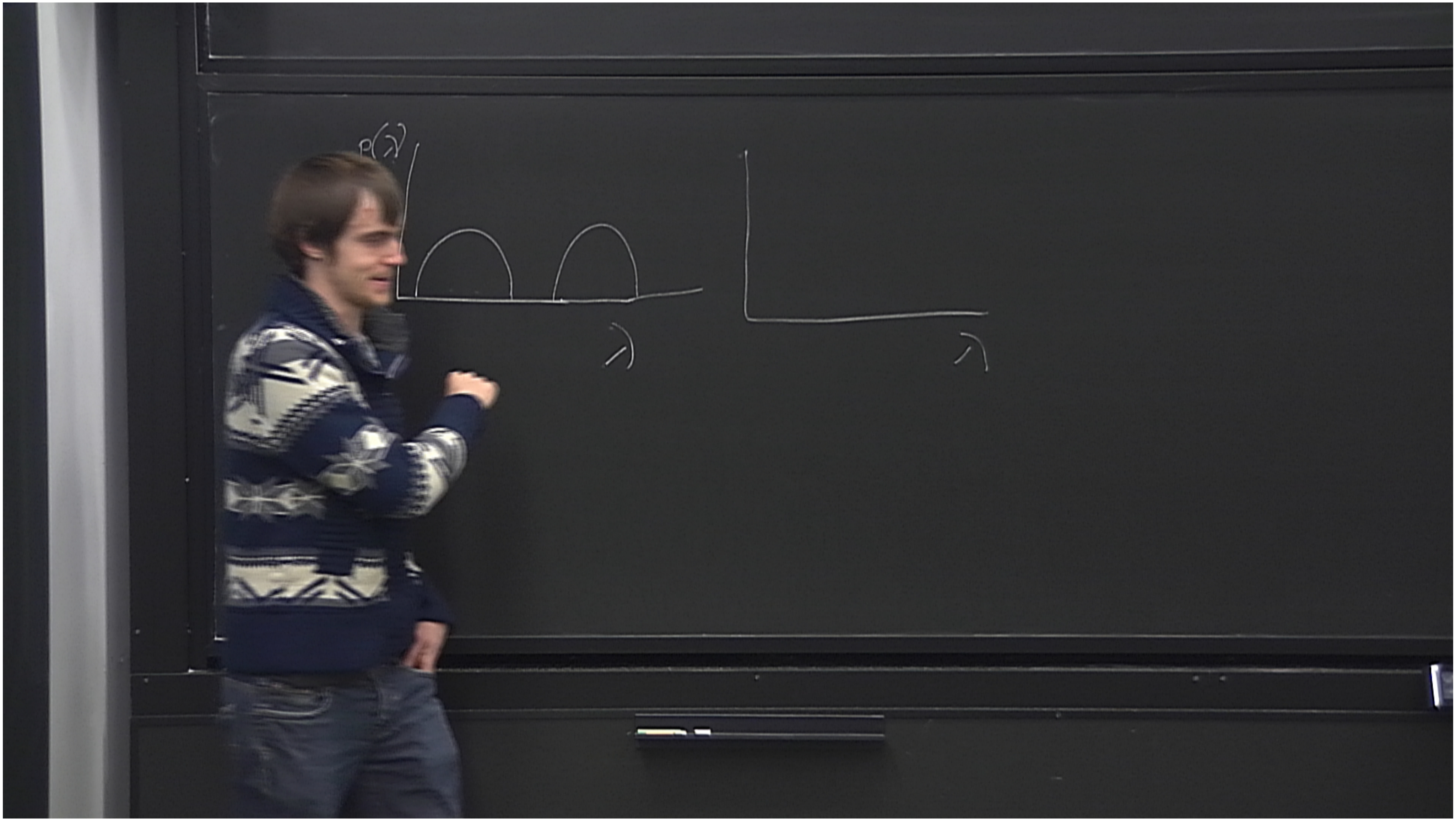
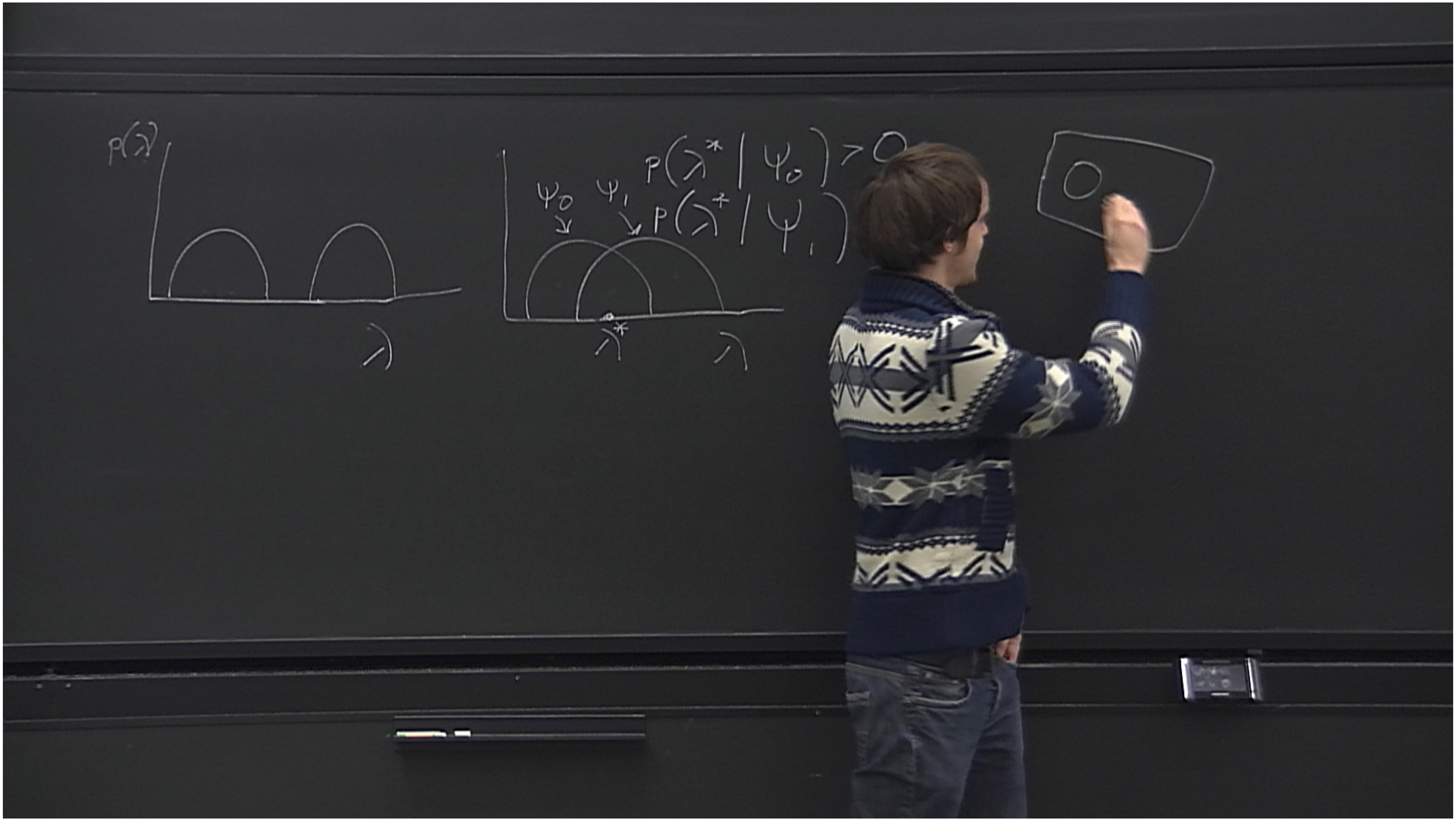
Title: 13/14 PSI - Foundations of Quantum Mechanics - Lecture 11

Date: Jan 20, 2014 04:00 PM

URL: http://pirsa.org/14010060

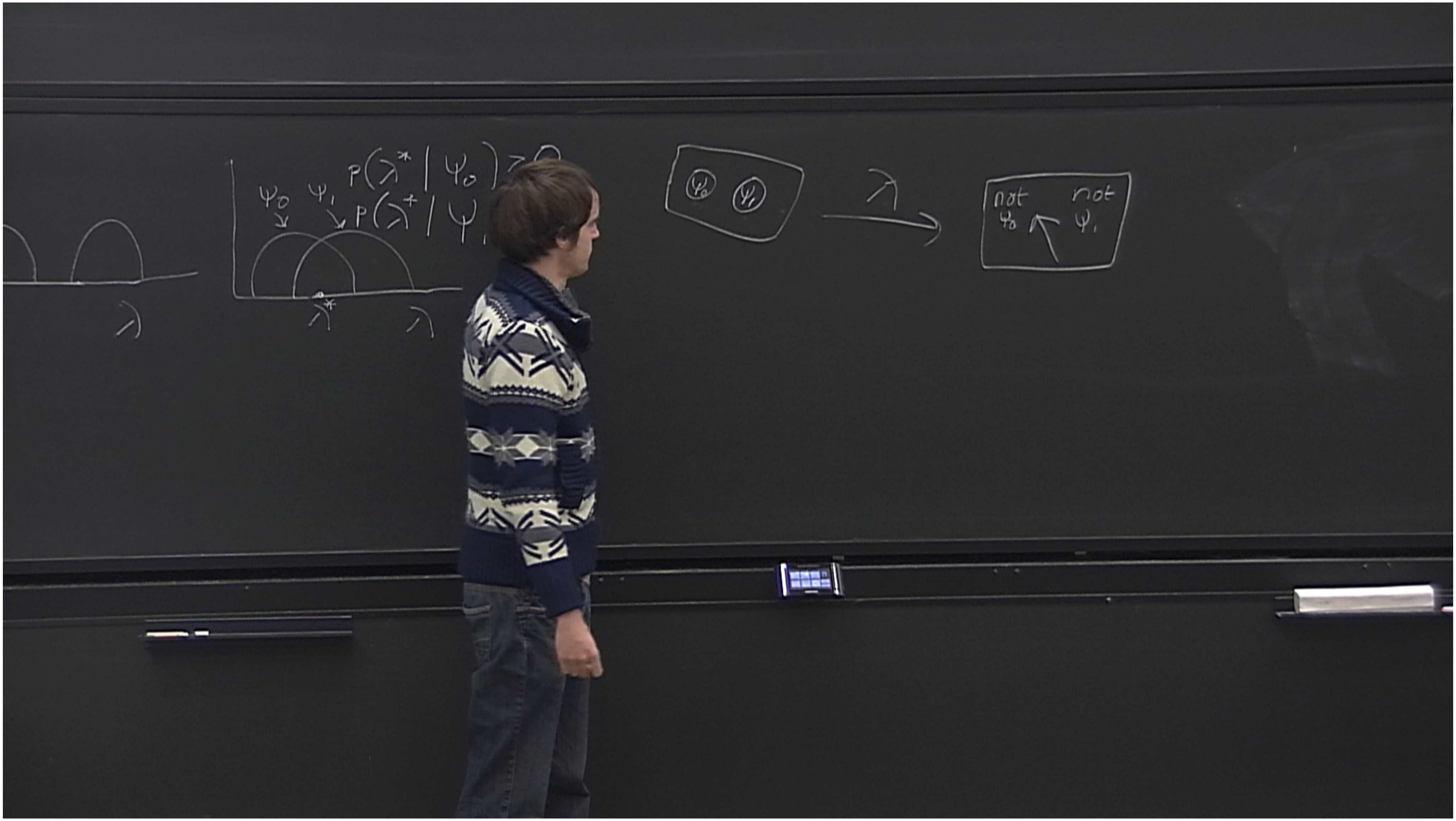
Abstract:

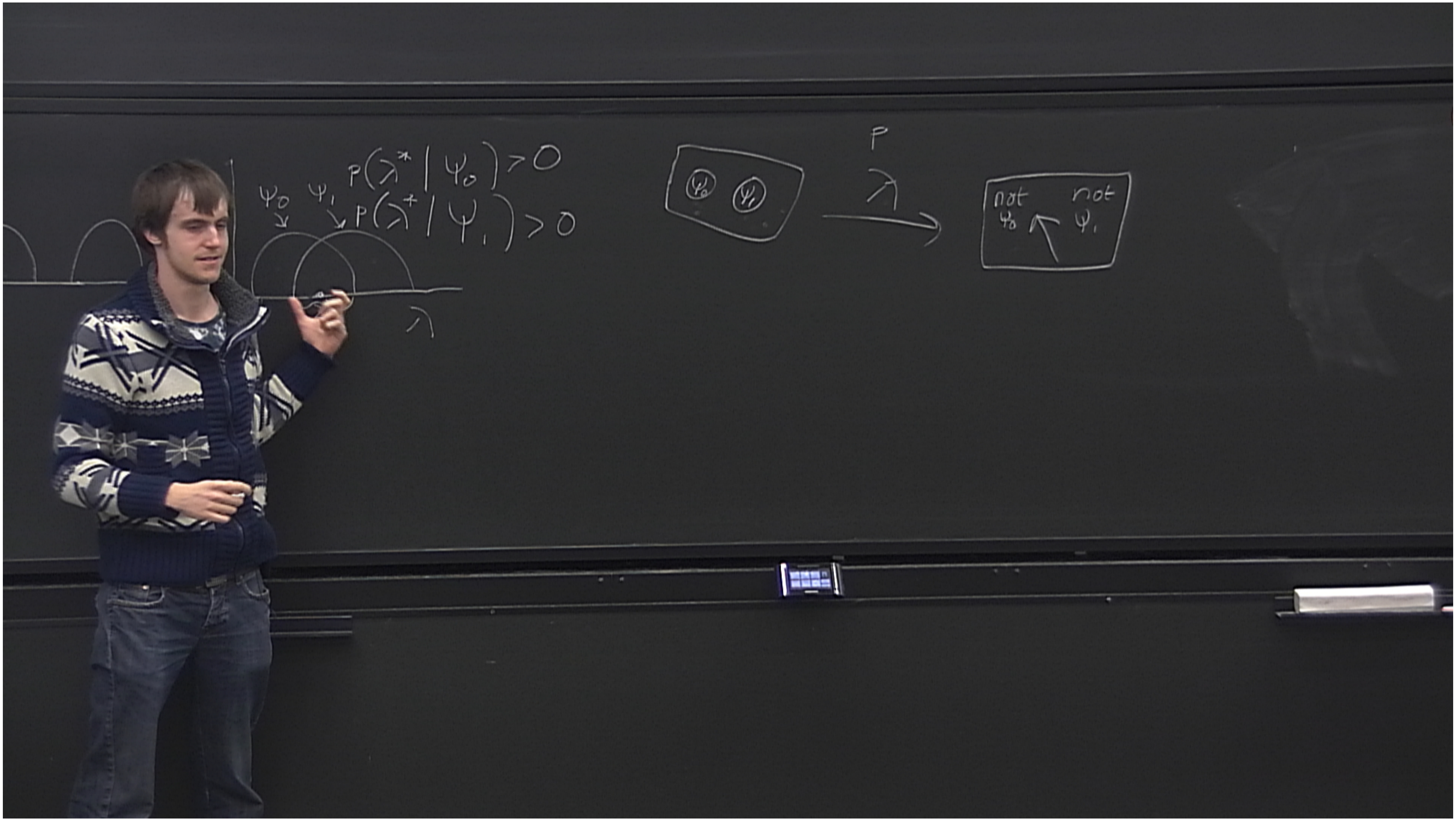

P(λ)
λ
λ



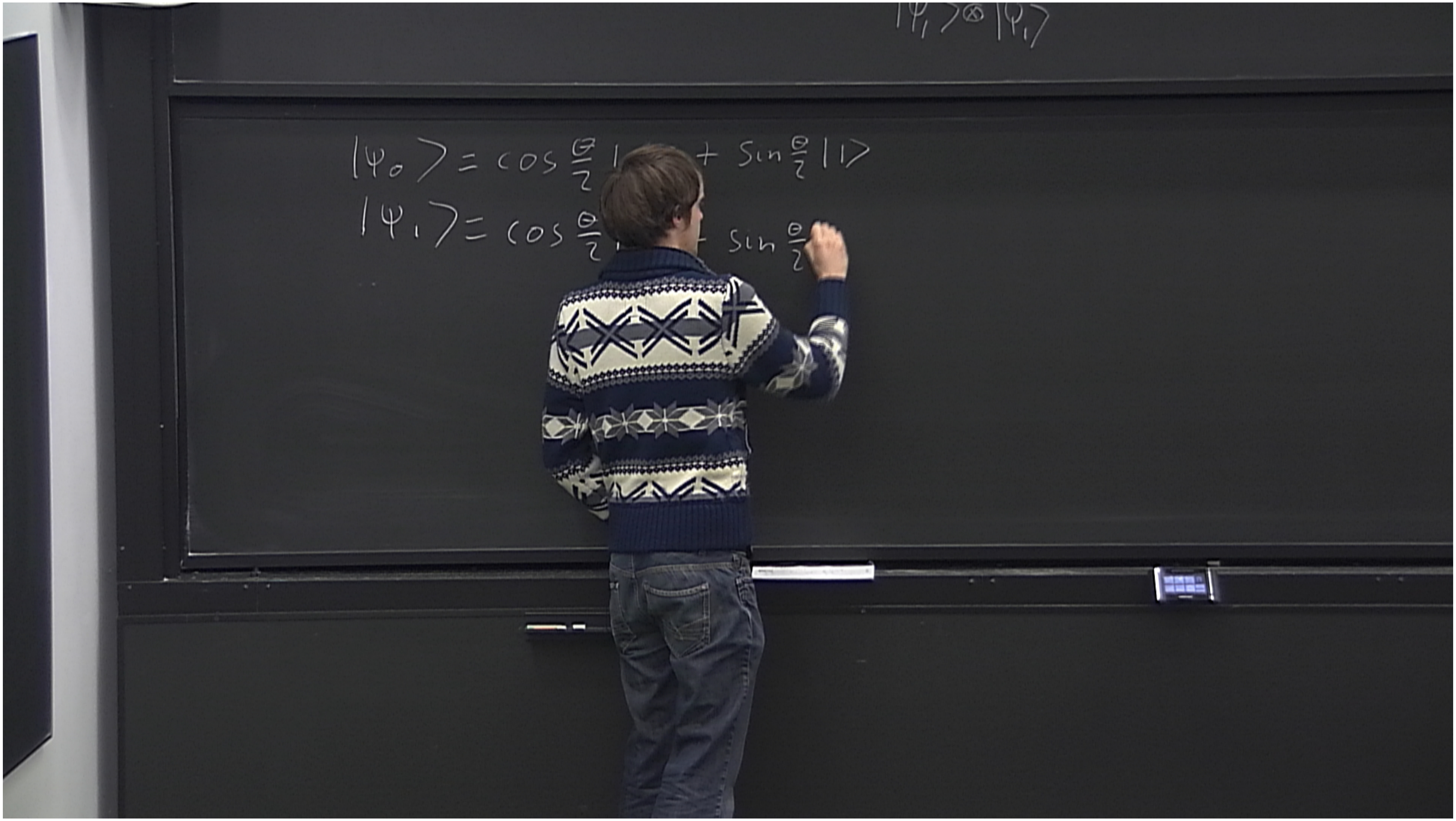
p(λ)
λ
ψ0
ψ1
p(λ* | ψ0) > 0
p(λ* | ψ1)
λ*
λ

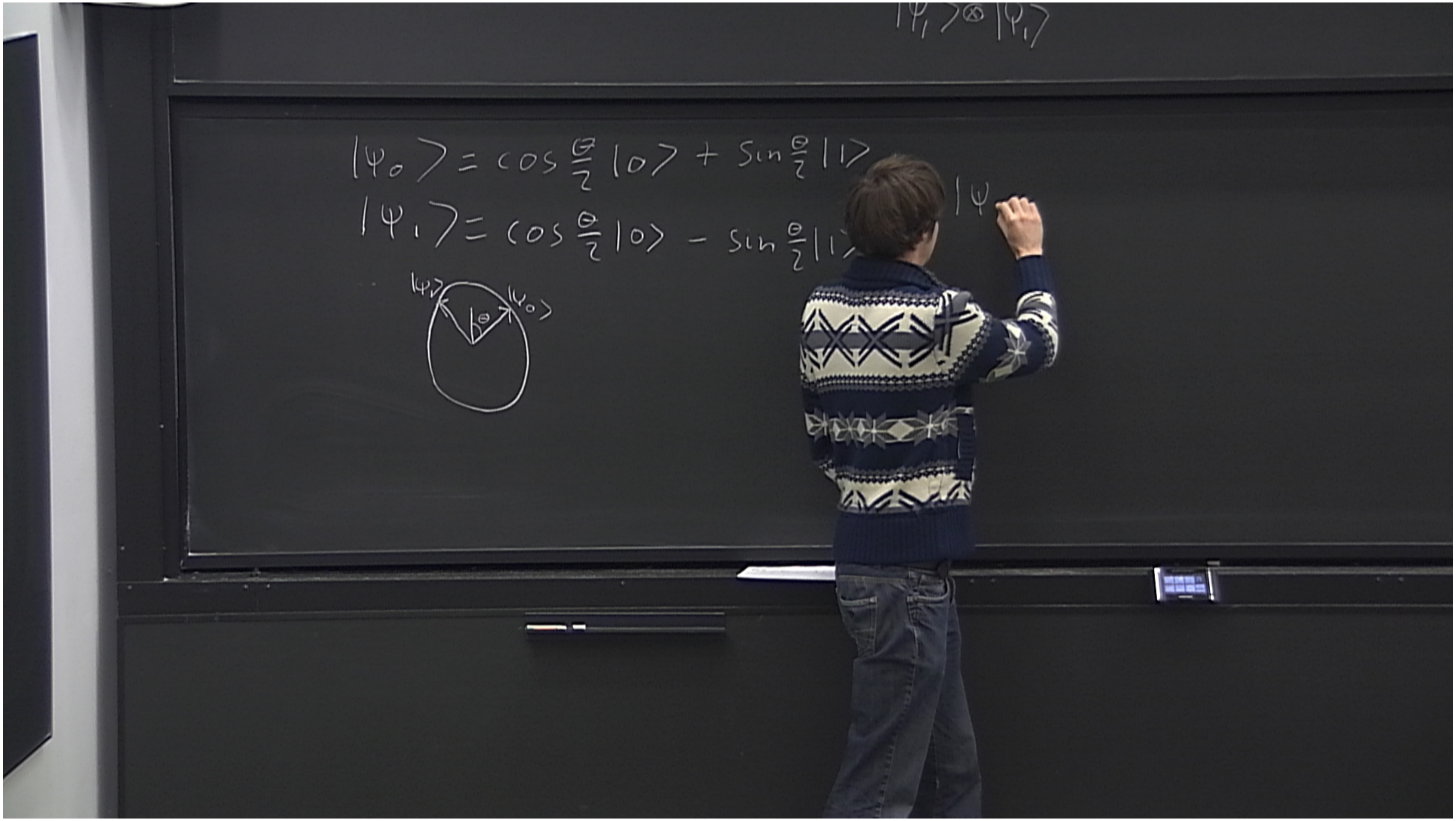
P(λ)
λ
Ψ0 Ψ1
P(λ* | Ψ0
P(λ* | Ψ1
λ*
Ψ0 Ψ1
λ

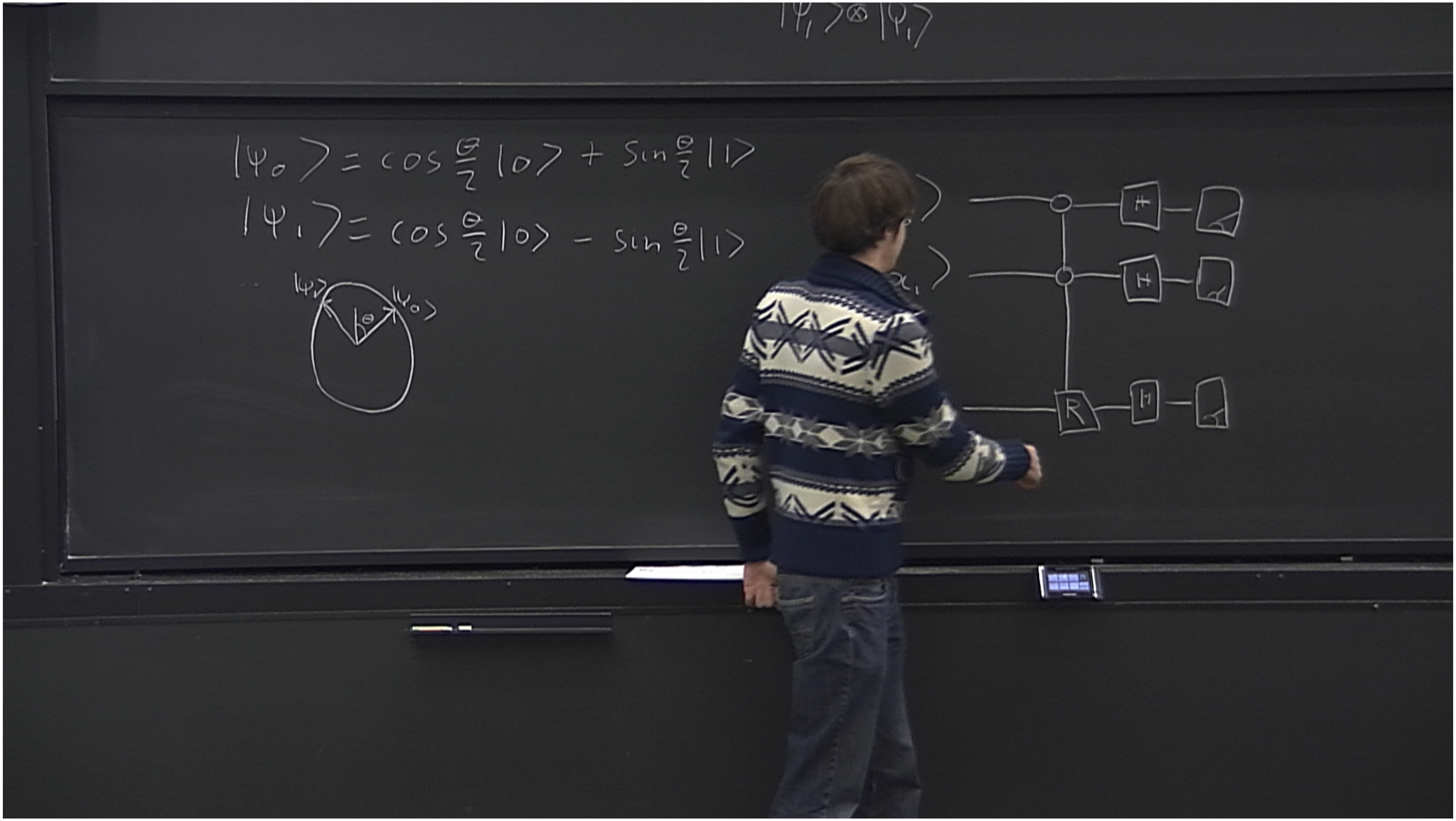

$P(\lambda^* | \psi_0) > 0$
ψ_0 ψ_1
$P(\lambda^* | \psi_1$
λ^*
λ
λ
ψ_0 ψ_1
λ
not ψ_0
not ψ_1

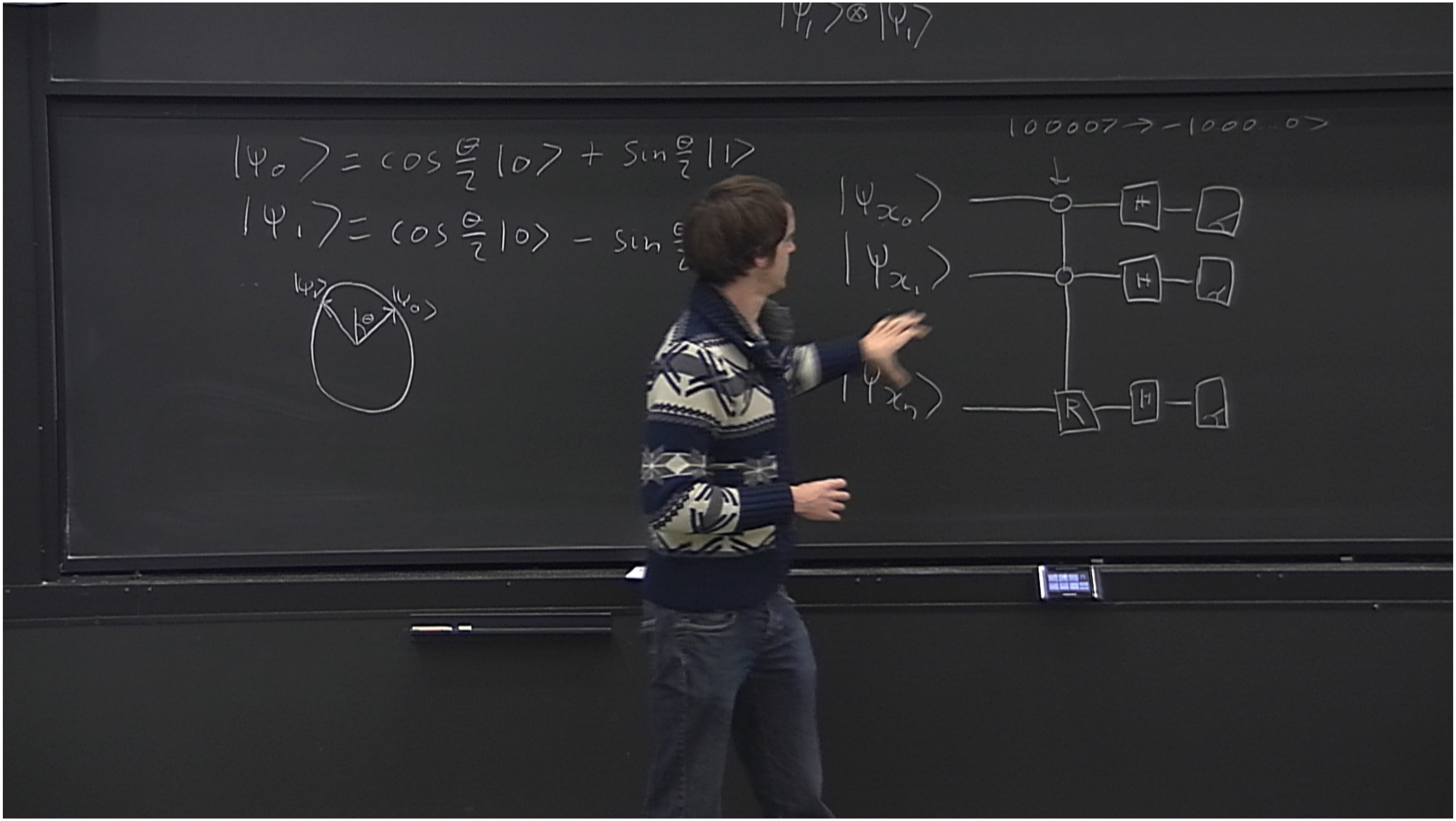

P(λ* | ψ0) > 0
ψ0 ψ1 P(λ* | ψ1) > 0
λ
ψ0 ψ1
P
λ
not ψ0
not ψ1

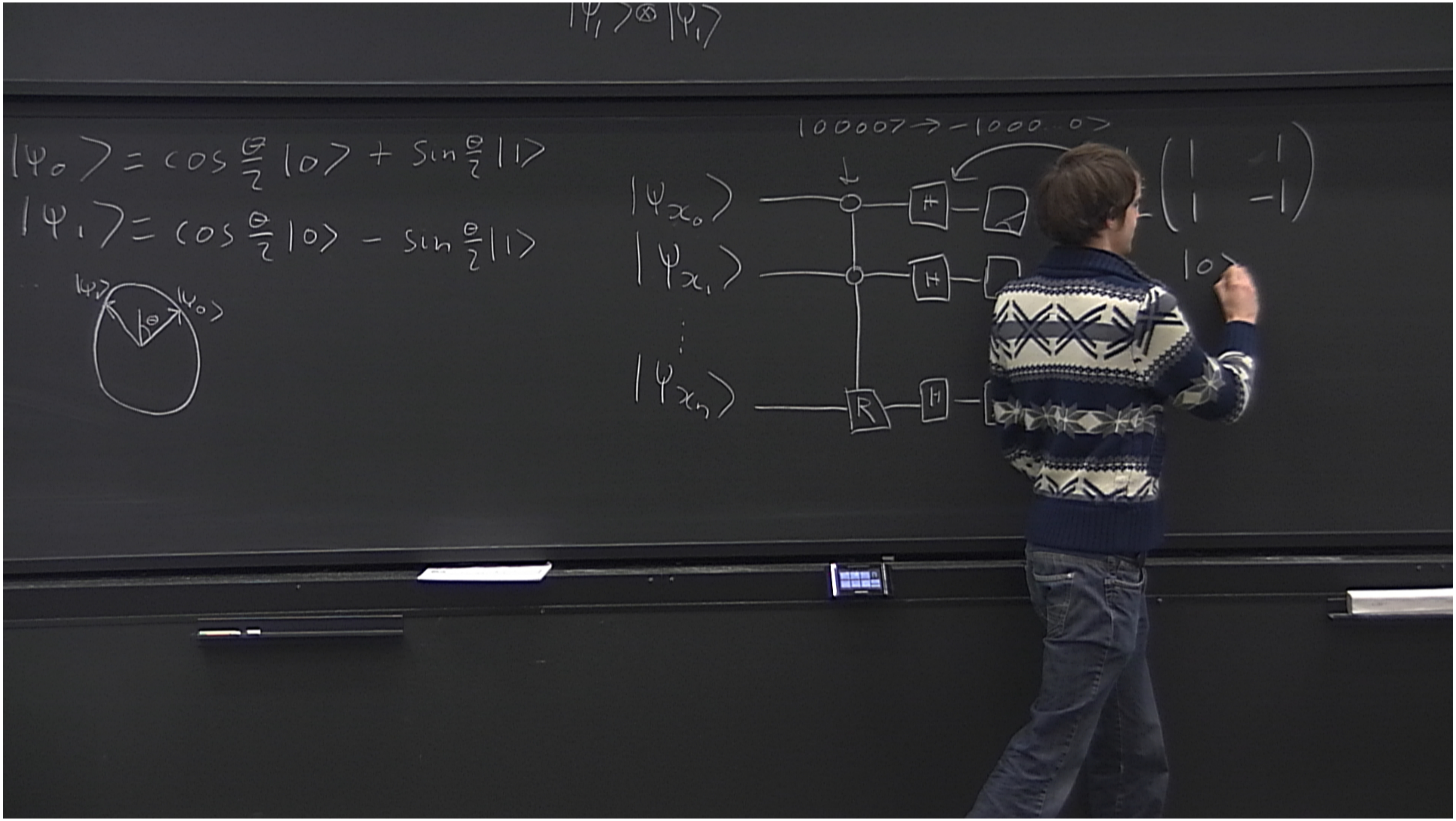
p(λ)
λ
ψ0 ψ1
P(λ* | ψ) > 0
P(λ*
> 0
λ*
P²
λ
λ
not ψ0
not ψ1


|ψ₁⟩⊗|ψ₁⟩
|ψ₀⟩ = cos θ/2 | + sin θ/2 |1⟩
|ψ₁⟩ = cos θ/2 sin θ/2

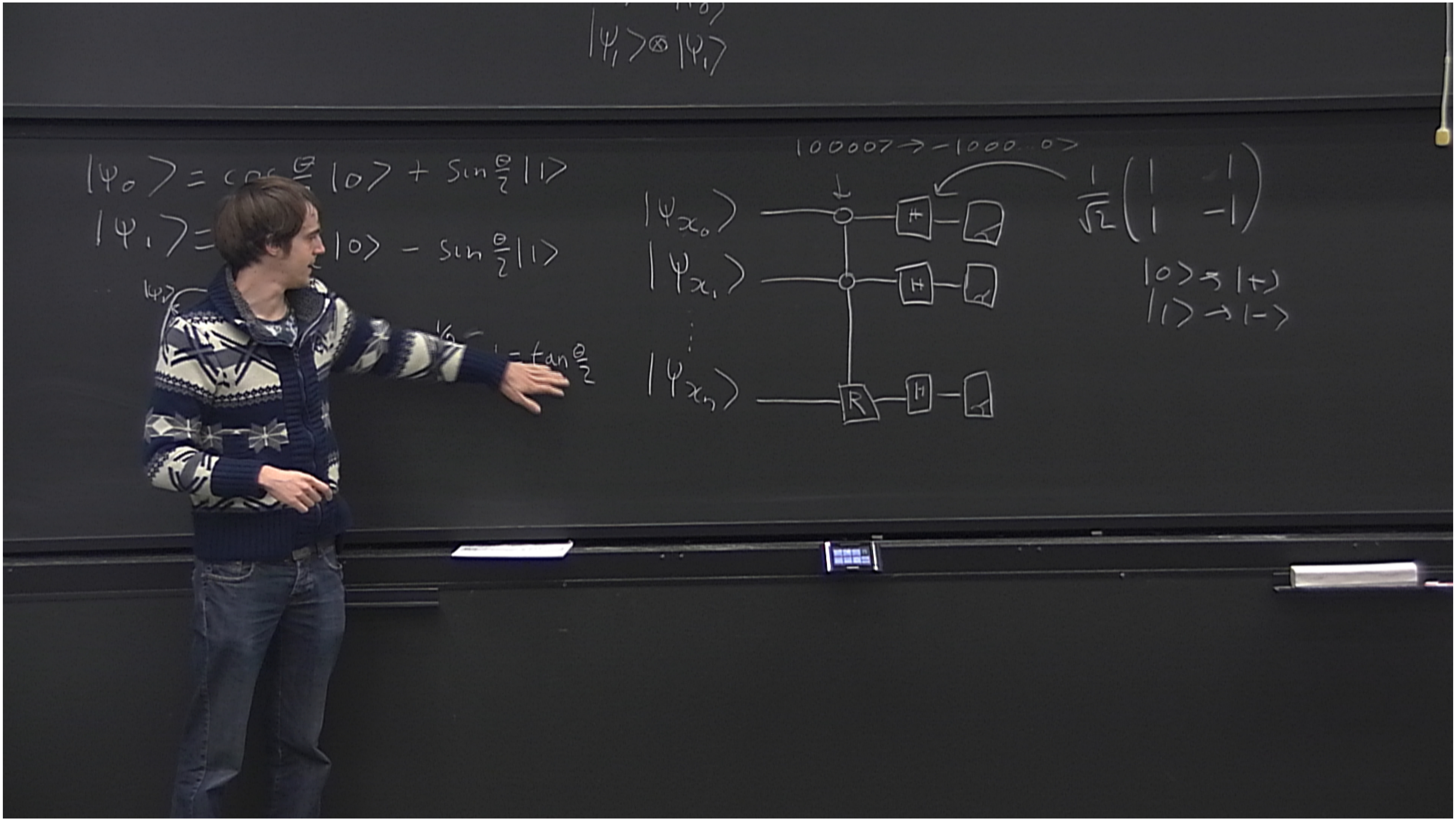

|ψ1>⊗|ψ1>
|ψ0> = cos θ/2 |0> + sin θ/2 |1>
|ψ1> = cos θ/2 |0> - sin θ/2 |1>
|ψ1>
|ψ0>
θ
|ψ


|ψ₁⟩⊗|ψ₁⟩
|ψ₀⟩ = cos θ/2 |0⟩ + sin θ/2 |1⟩
|ψ₁⟩ = cos θ/2 |0⟩ − sin θ/2 |1⟩
|ψ₁⟩
|ψ₀⟩
θ
H
H
R
H

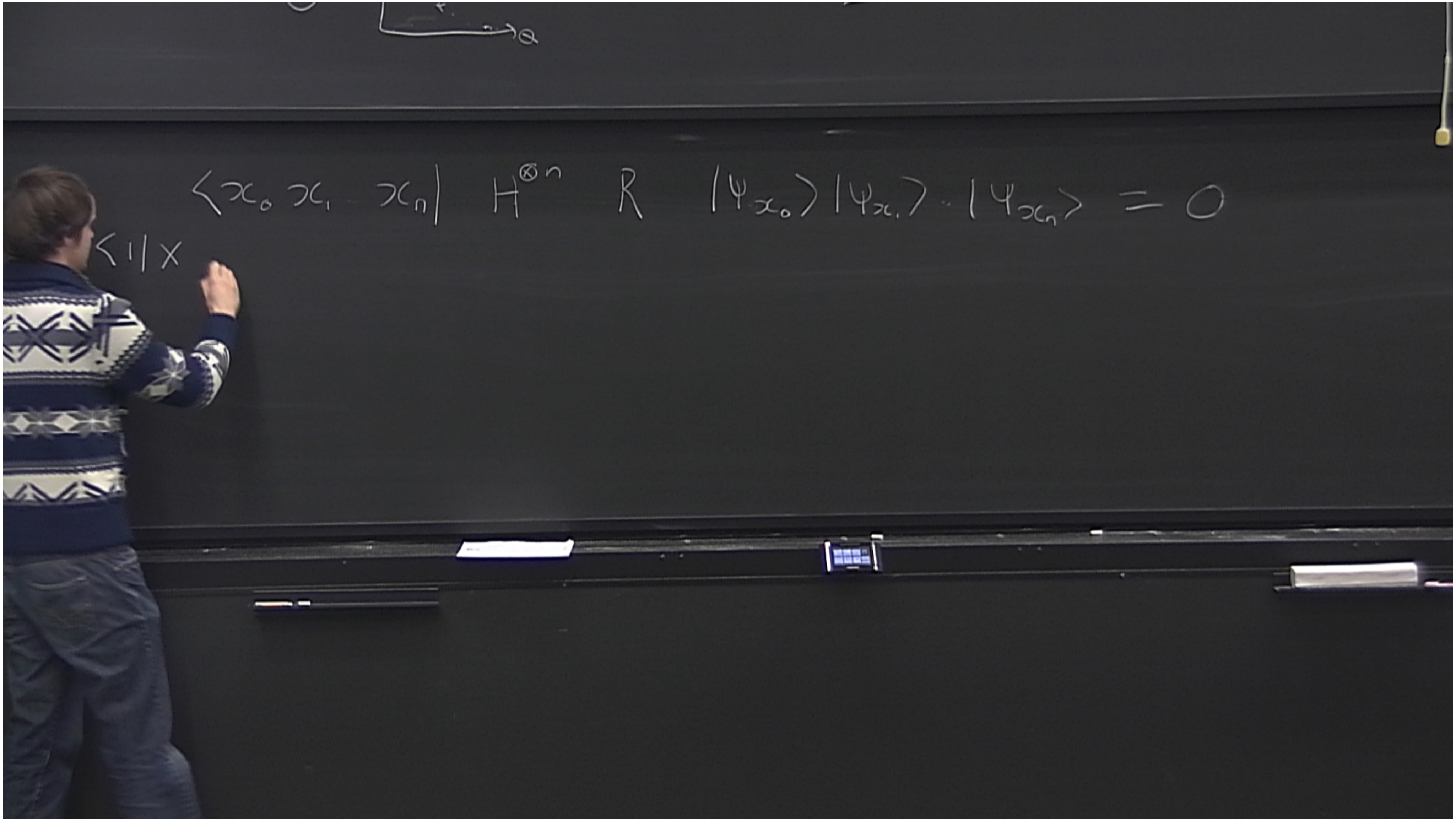

|ψ0> = cos θ/2 |0> + sin θ/2 |1>
|ψ1> = cos θ/2 |0> - sin
|100007 → -|1000...0>
|ψx0>
|ψx1>
|ψxn>
R

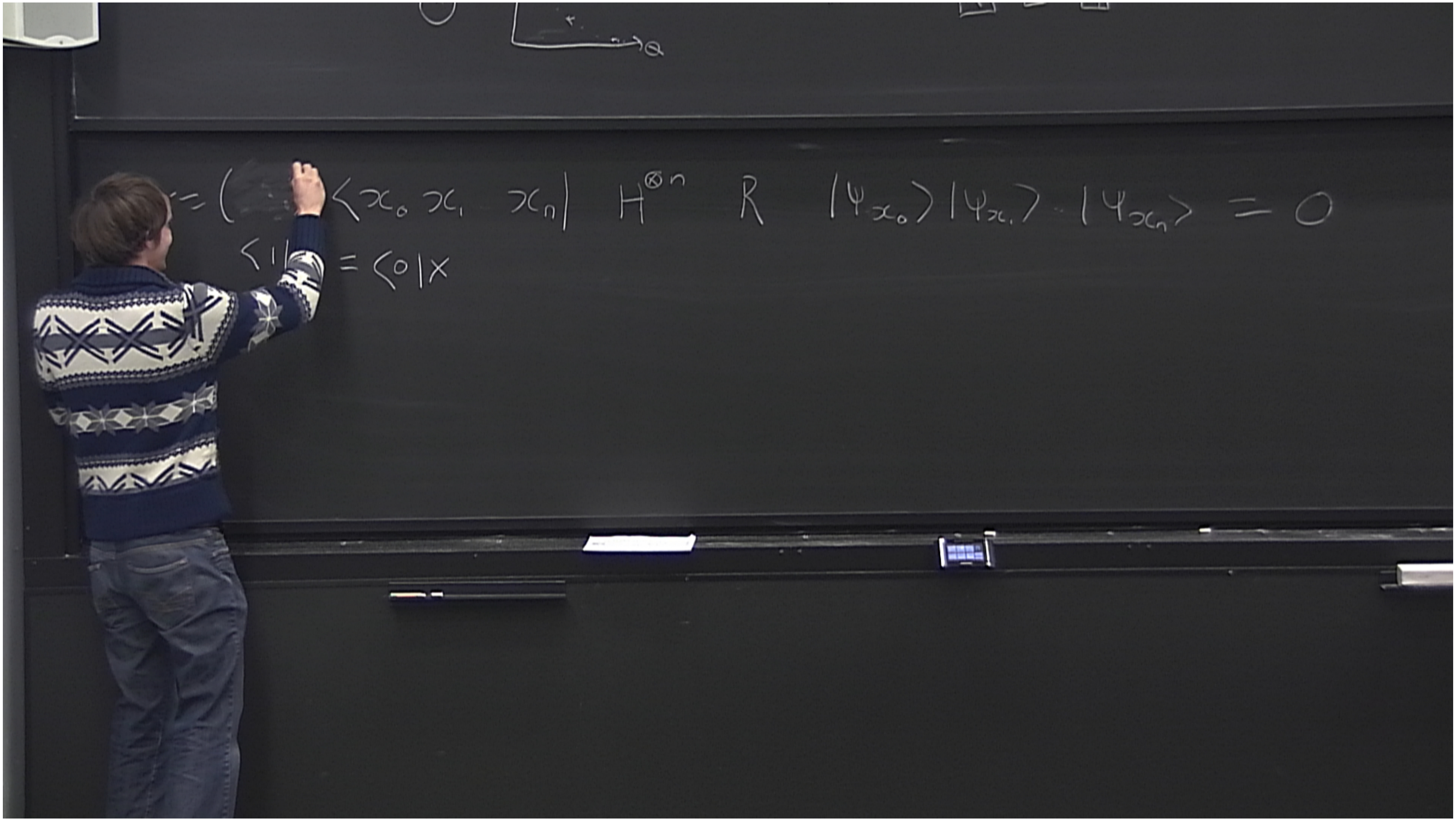


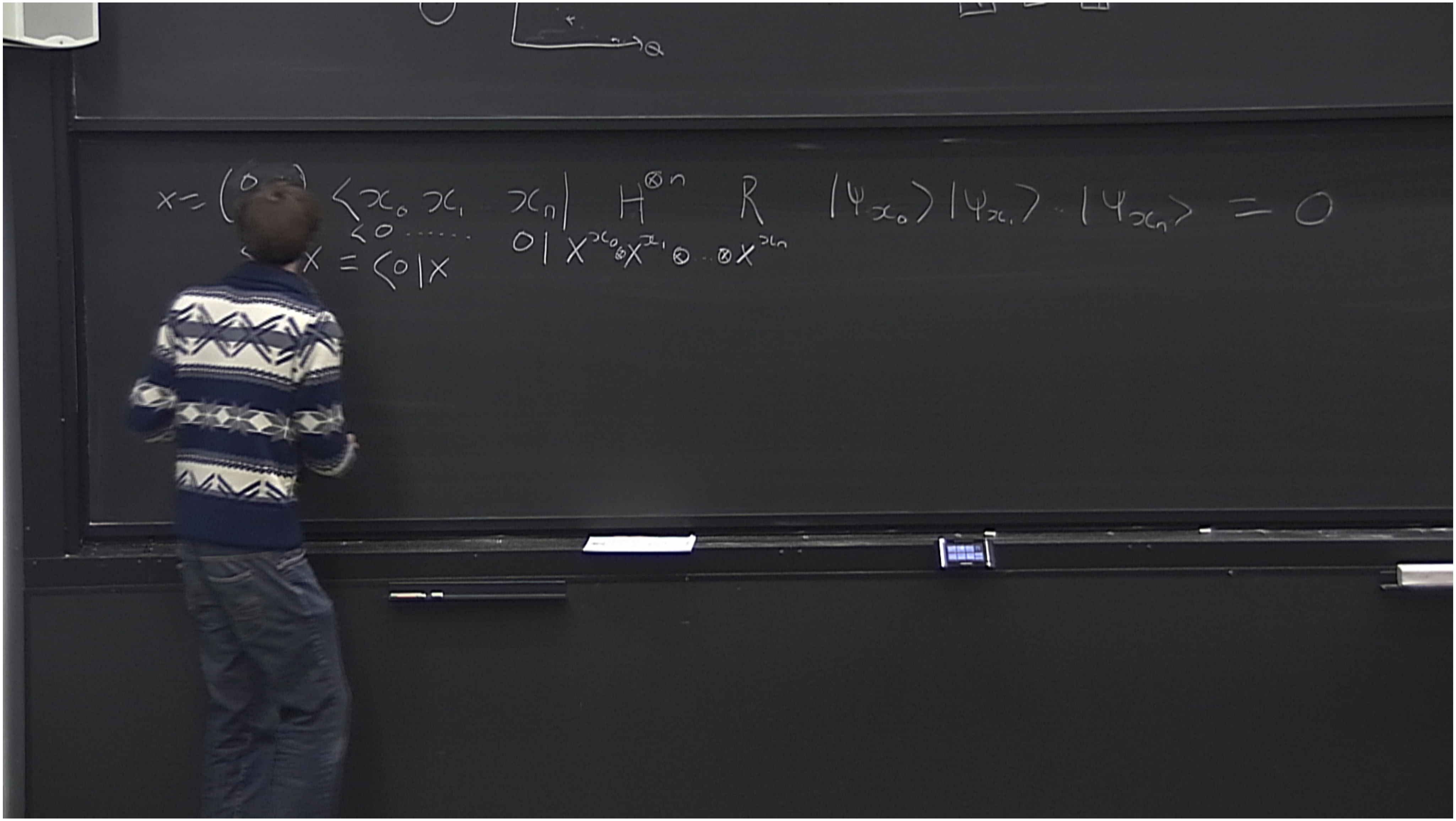
|ψ₁>⊗|ψ₁>
|ψ₀> = cos θ/2 |0> + sin θ/2 |1>
|ψ₁> = cos θ/2 |0> − sin θ/2 |1>
|ψ₁> |ψ₀>
|10000> → −|000...0>
|ψ_{x₀}>
|ψ_{x₁}>
|ψ_{xₙ}>
H
R
|0>

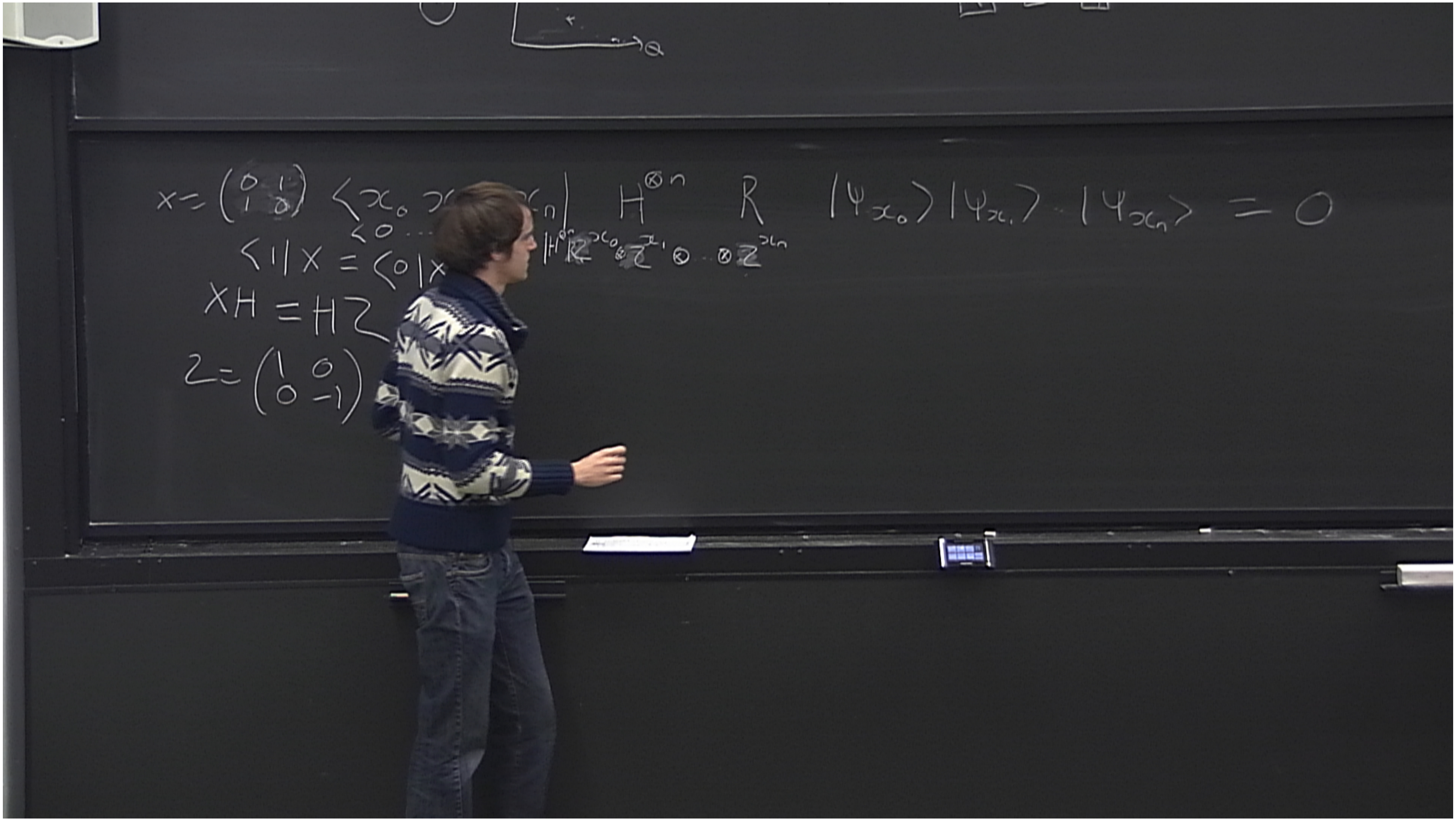


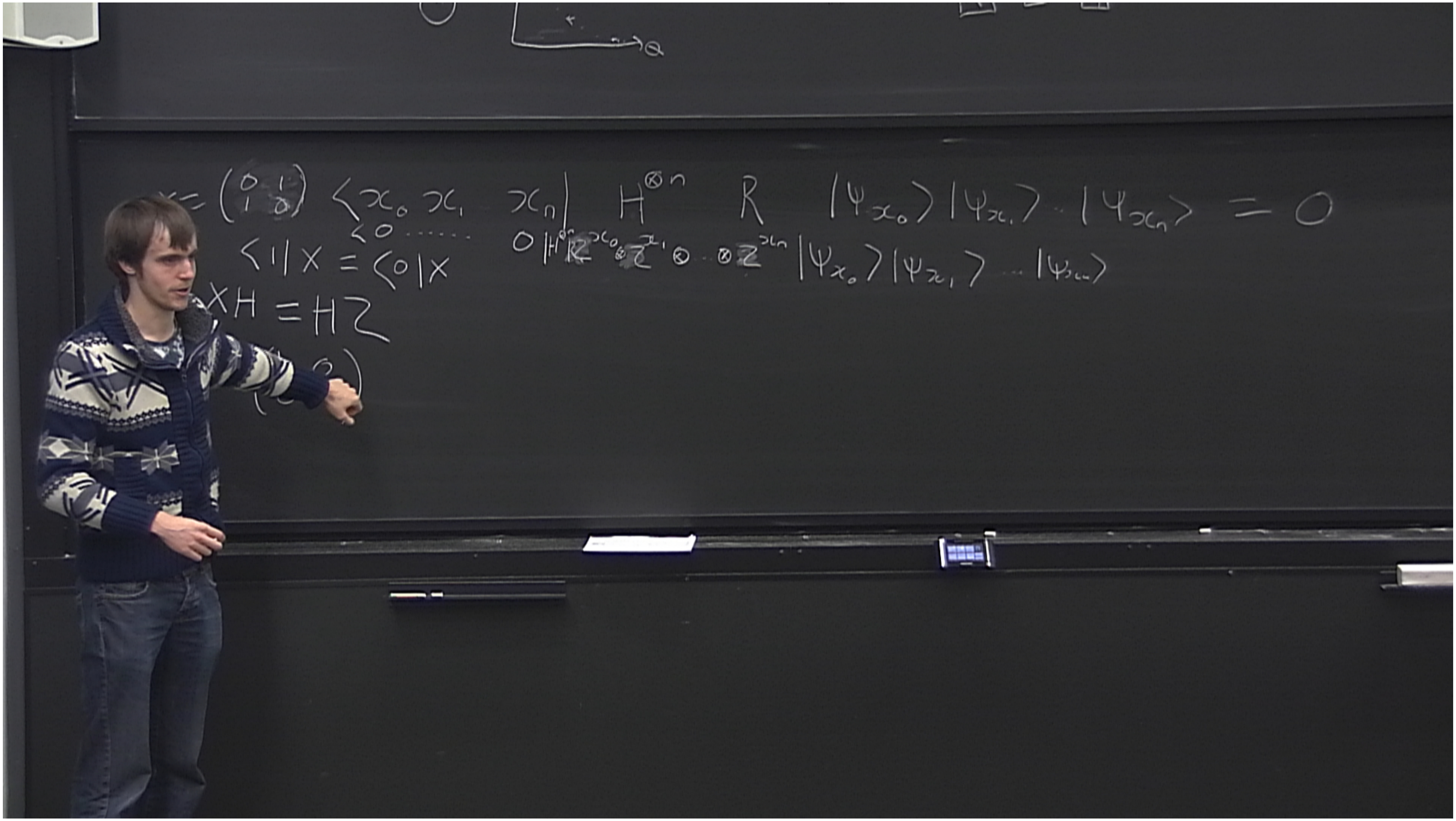
|ψ1> ⊗ |ψ1>
|ψ0> = cos θ/2 |0> + sin θ/2 |1>
|0> - sin θ/2 |1>
= tan θ/2
|00000> → -|000...0>
|ψx0>
|ψx1>
|ψxn>
H
R
1/√2 (1 1; 1 -1)
|0> → |+>
|1> → |->


$\langle x_0 x_1 \cdot x_n | \; H^{\otimes n} \; R \; |\psi_{x_0}\rangle |\psi_{x_1}\rangle \cdot |\psi_{x_n}\rangle = 0$
$\langle 1 | X$

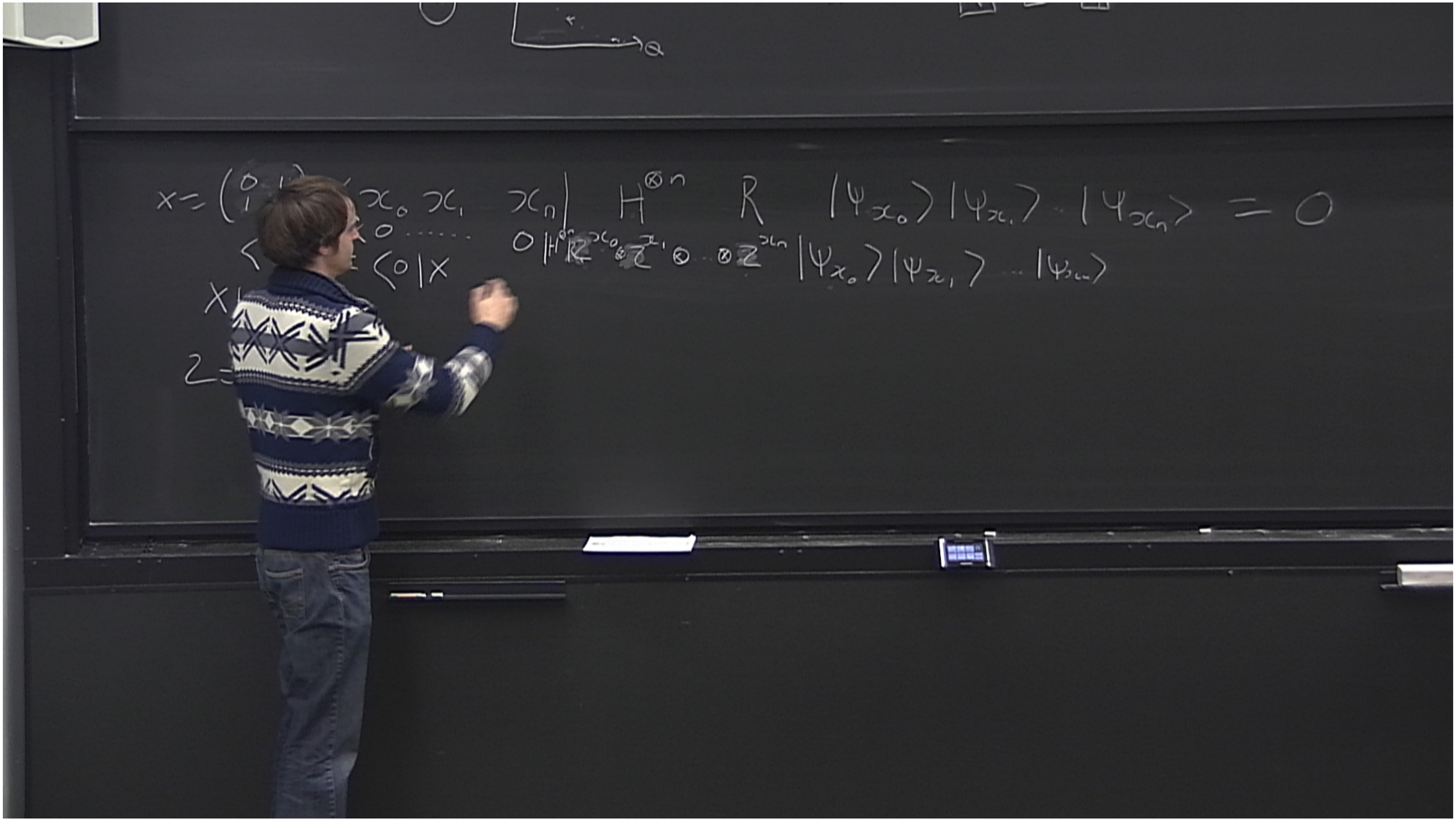

= (⟨x0 x1 xn| H⊗n R |ψx0⟩|ψx1⟩ |ψxn⟩ = 0
⟨1| = ⟨0|X

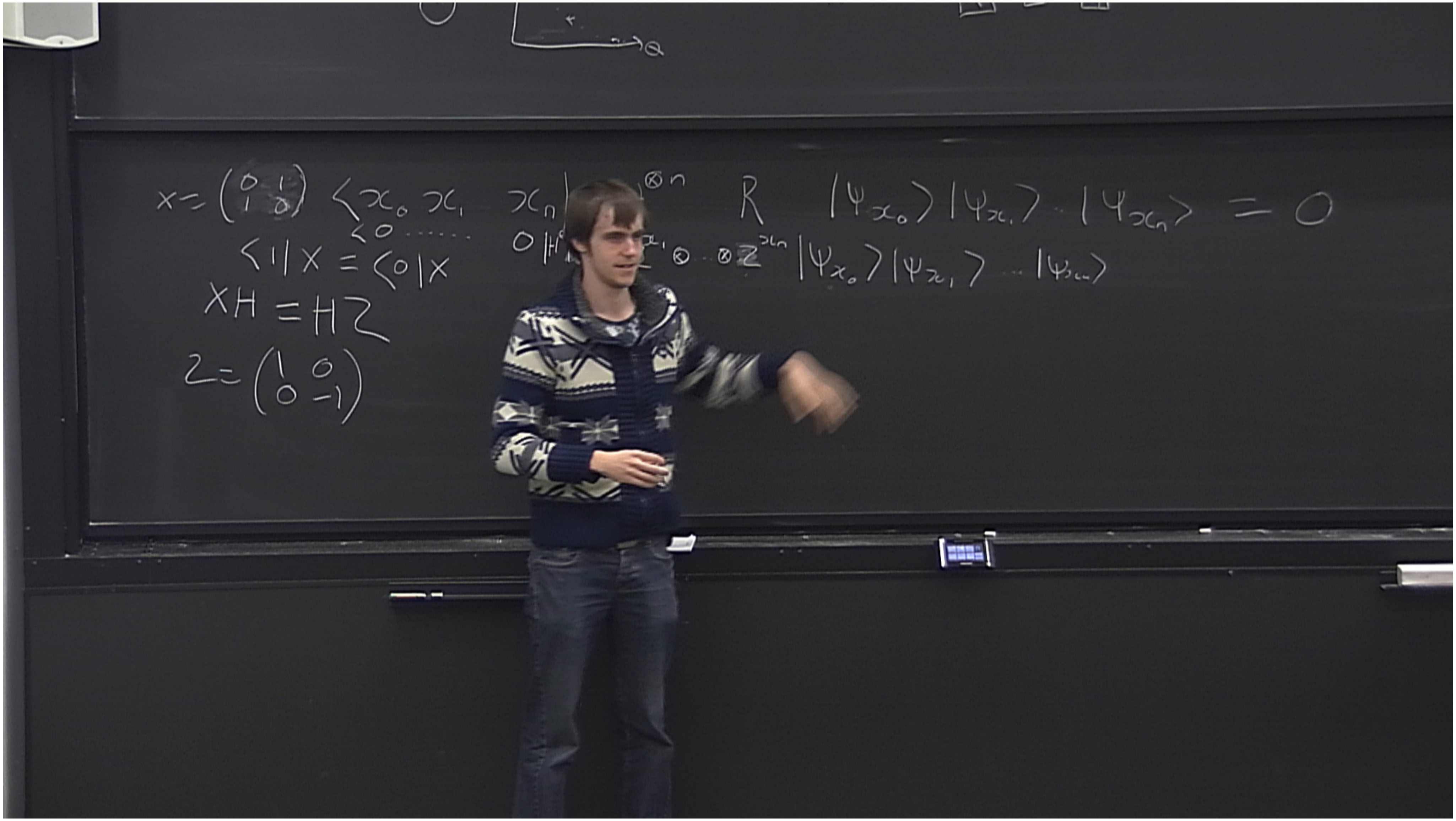


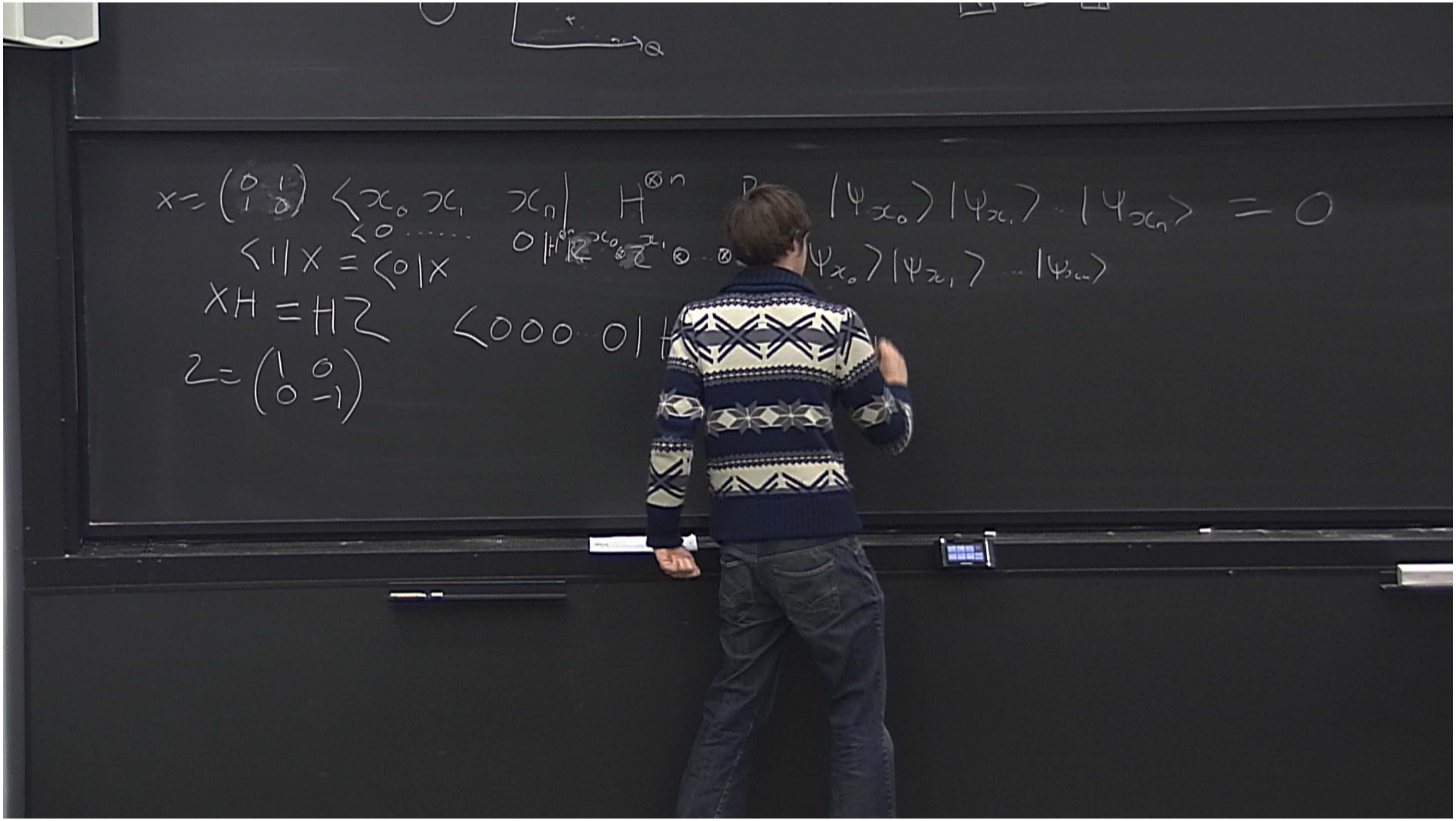

$x = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$
$H^{\otimes n}$ R $|\psi_{x_0}\rangle|\psi_{x_1}\rangle \cdots |\psi_{x_n}\rangle = 0$
$\langle 1 | X = \langle 0 | X$
$XH = HZ$
$Z = \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$

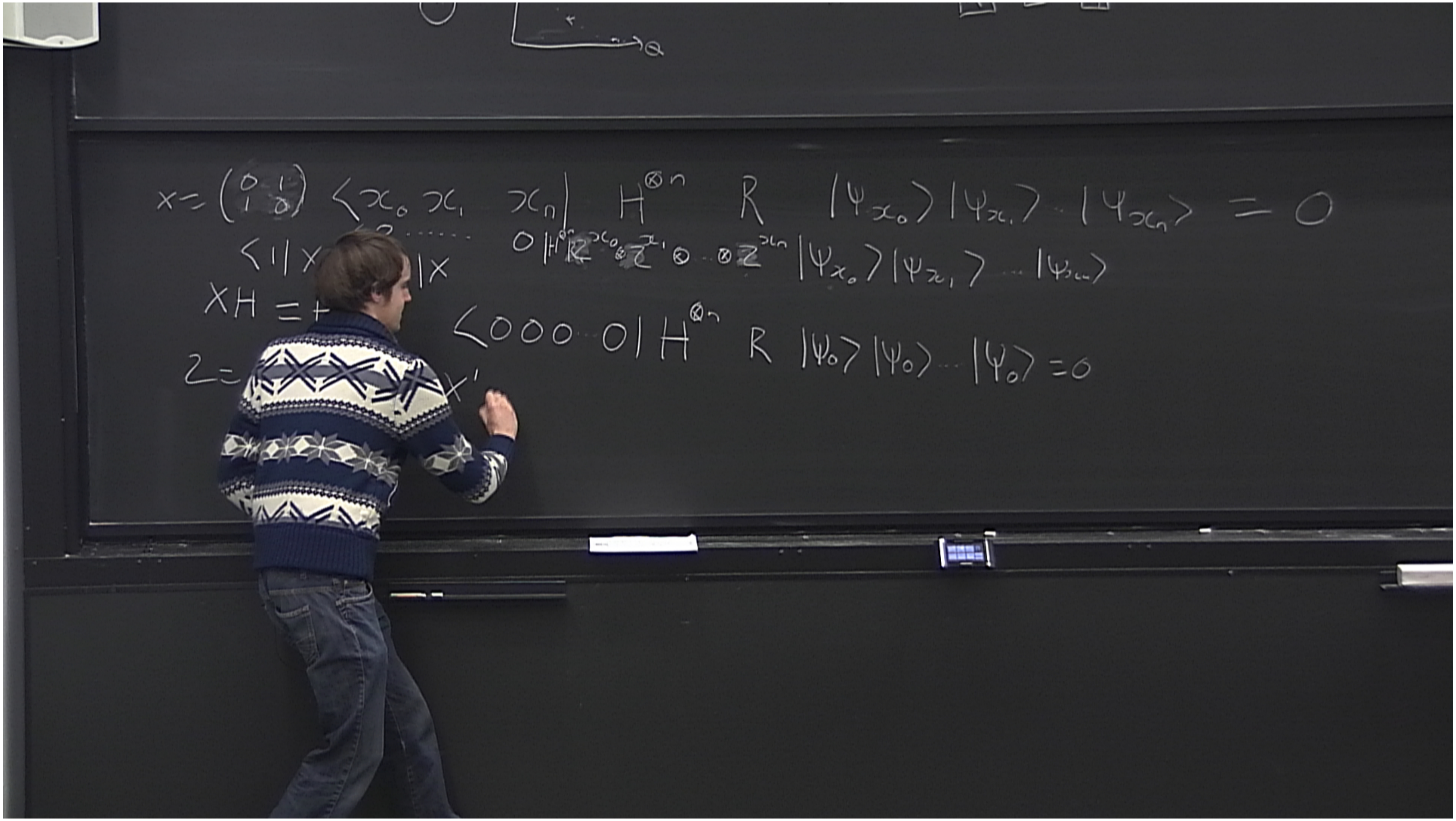


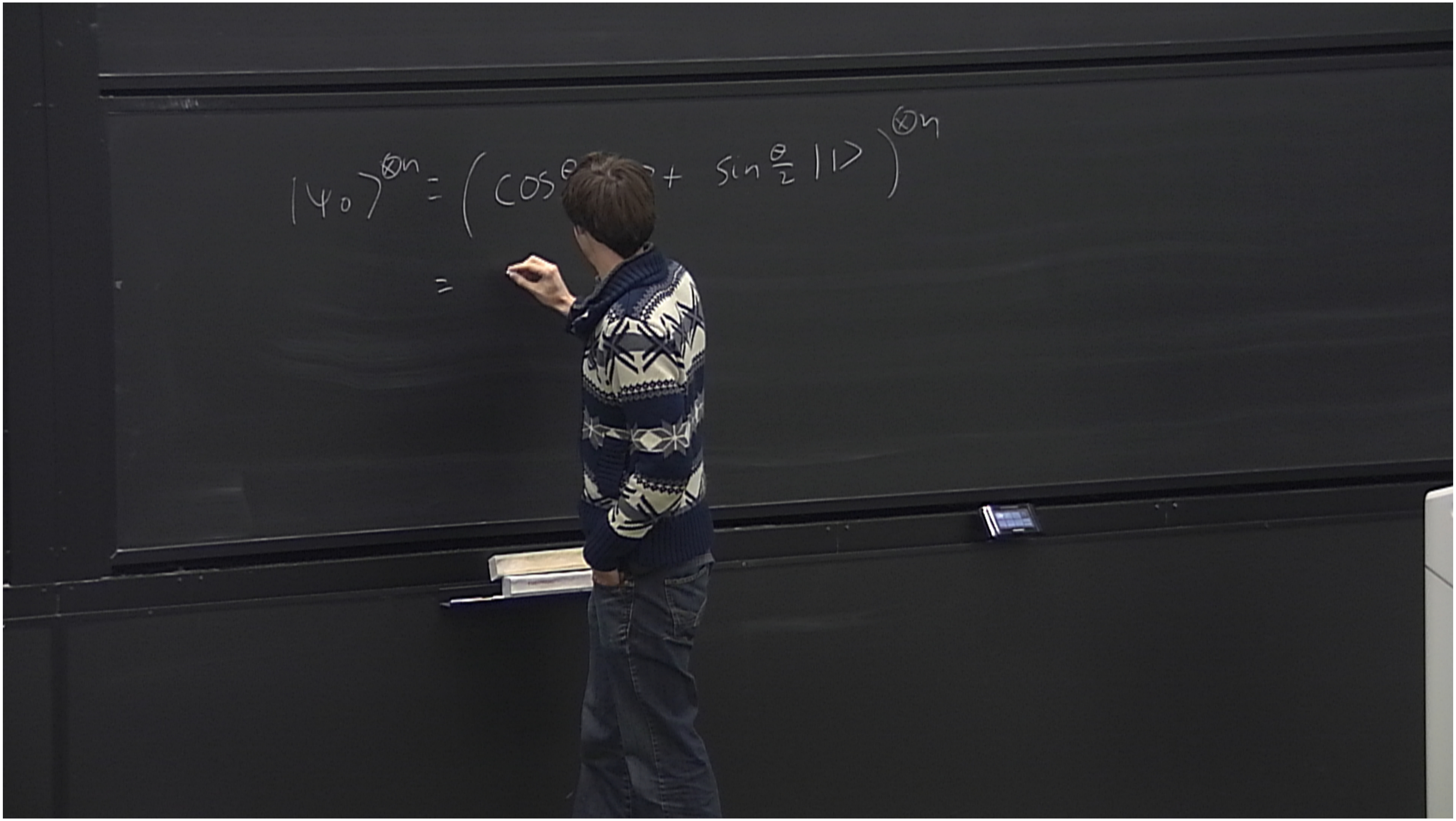
⟨1| X = ⟨0| X
XH = HZ




X = (0 1 / 1 0)
⟨1| X = ⟨0| X
XH = HZ
Z = (1 0 / 0 −1)
= 0


X = (0 1; 1 0) ⟨x0 x1 … xn| H⊗n … |ψx0⟩|ψx1⟩ … |ψxn⟩ = 0
⟨1|X = ⟨0|X
XH = HZ
Z = (1 0; 0 −1)

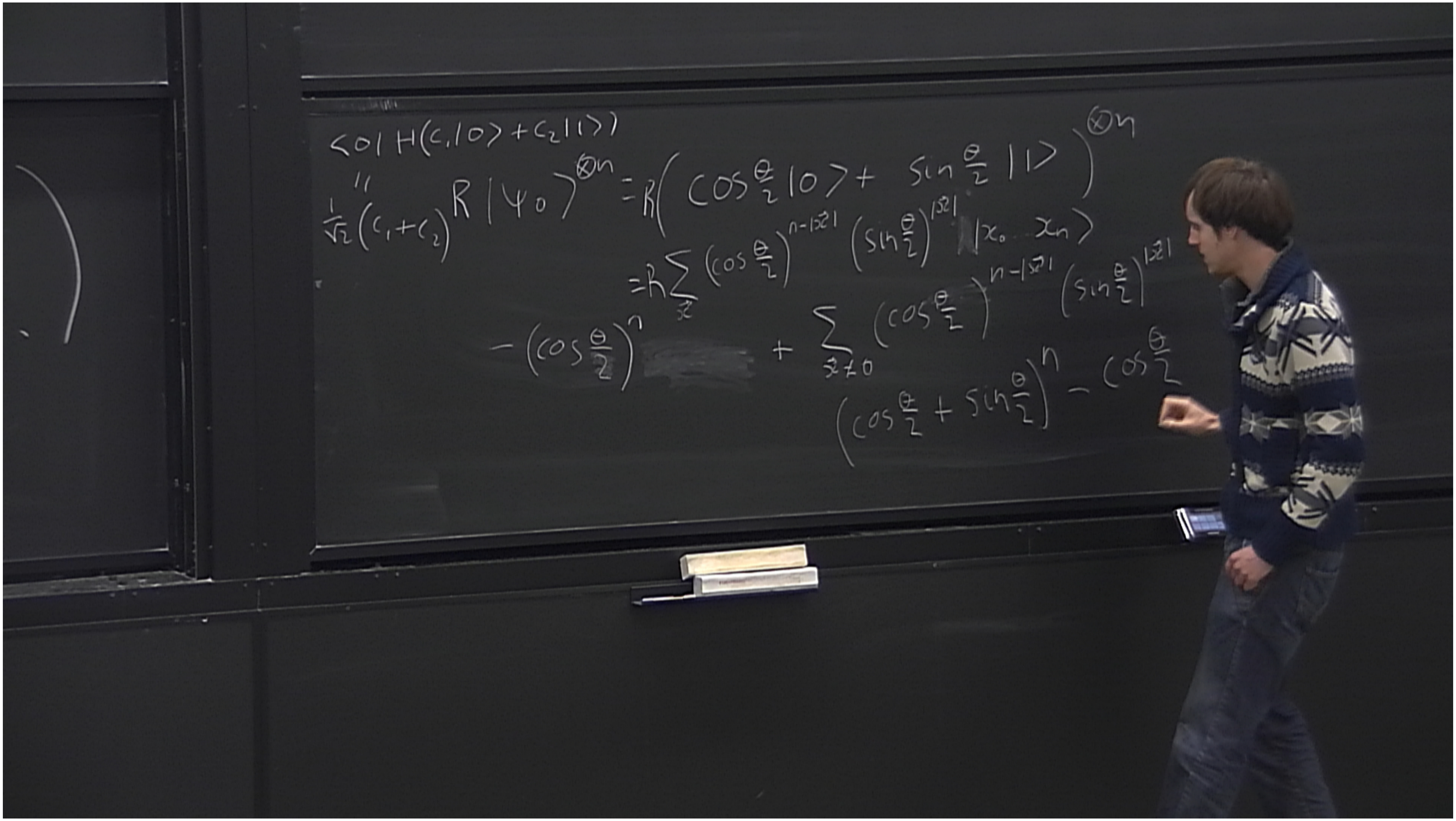


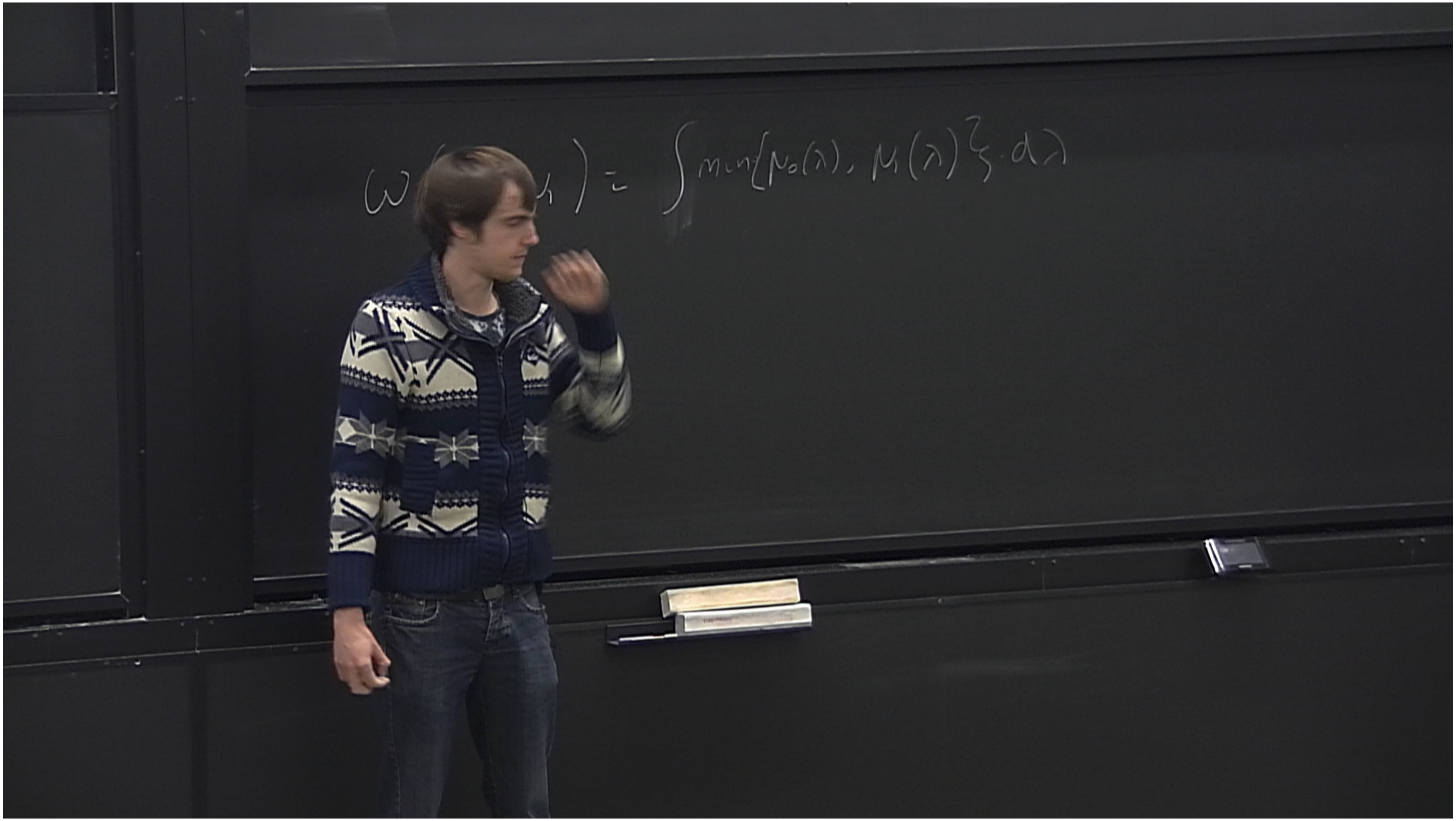

|ψ0⟩⊗n = (cos
+ sin θ/2 |1⟩)⊗n

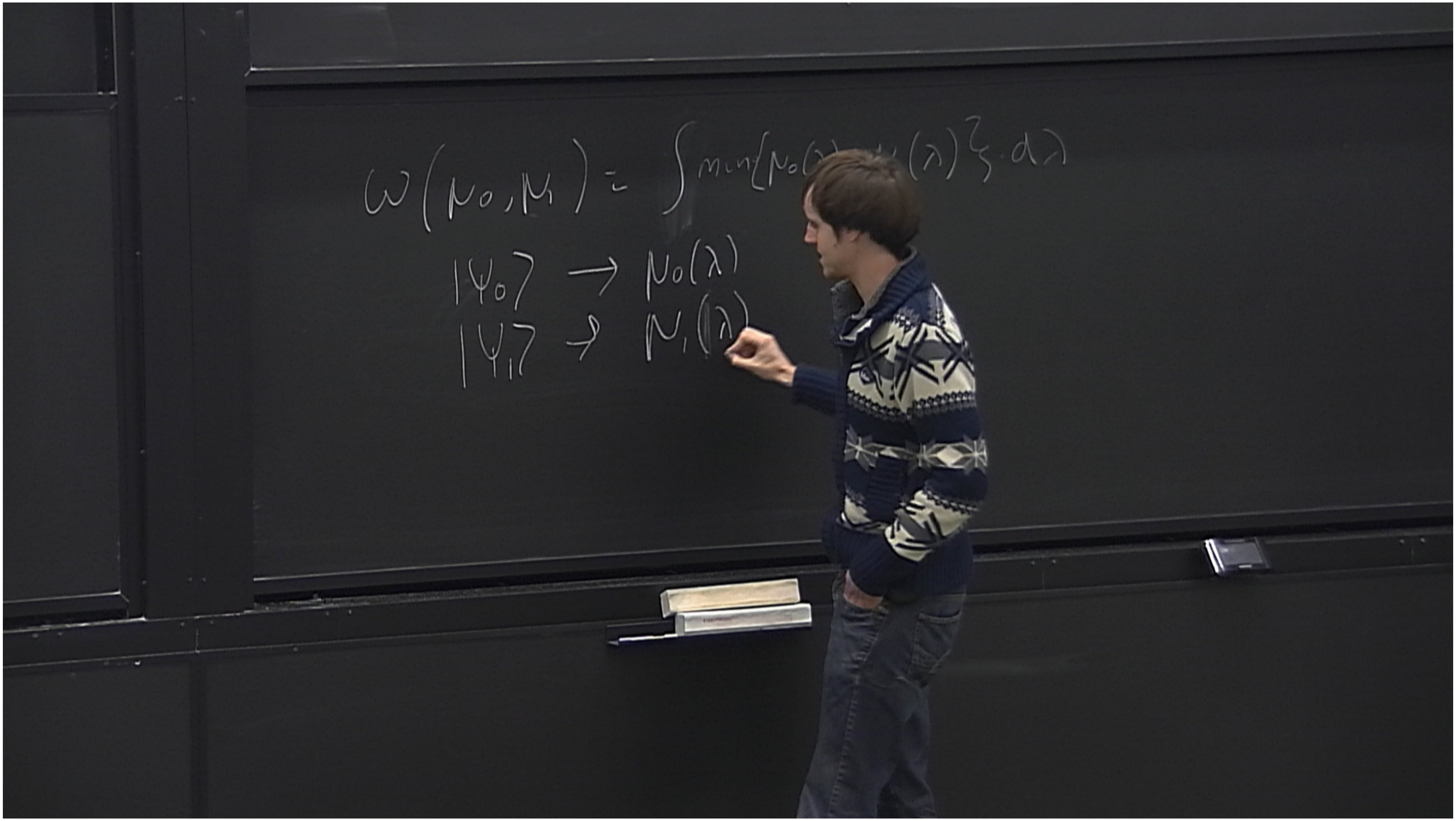
$$R|\psi_0\rangle^{\otimes n} = R\left(\cos\frac{\theta}{2}|0\rangle + \sin\frac{\theta}{2}|1\rangle\right)^{\otimes n}$$

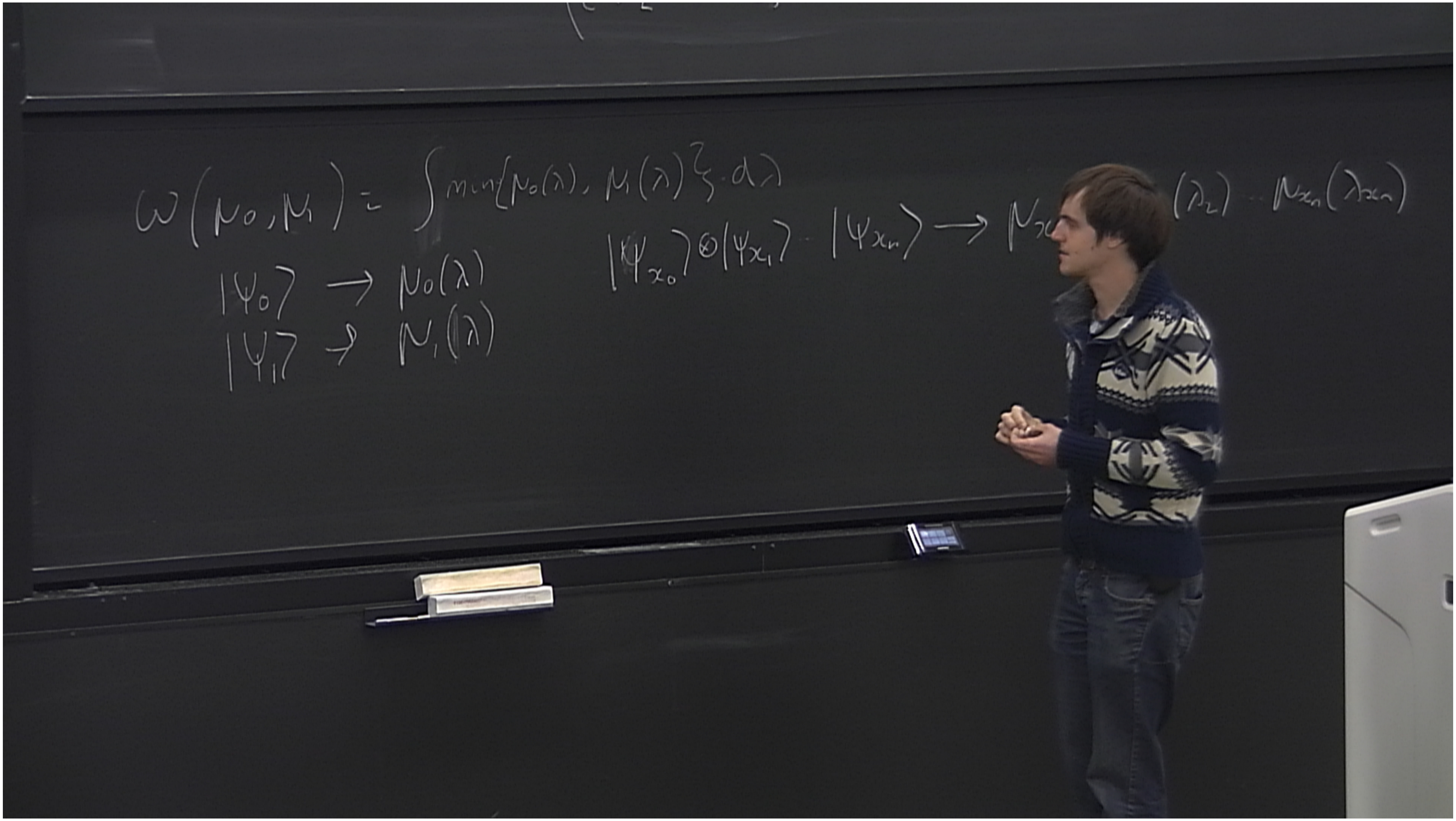
$$= R\sum_{x}\left(\cos\frac{\theta}{2}\right)^{n-|x|}\left(\sin\frac{\theta}{2}\right)^{|x|}|x_0 \dots x_n\rangle$$

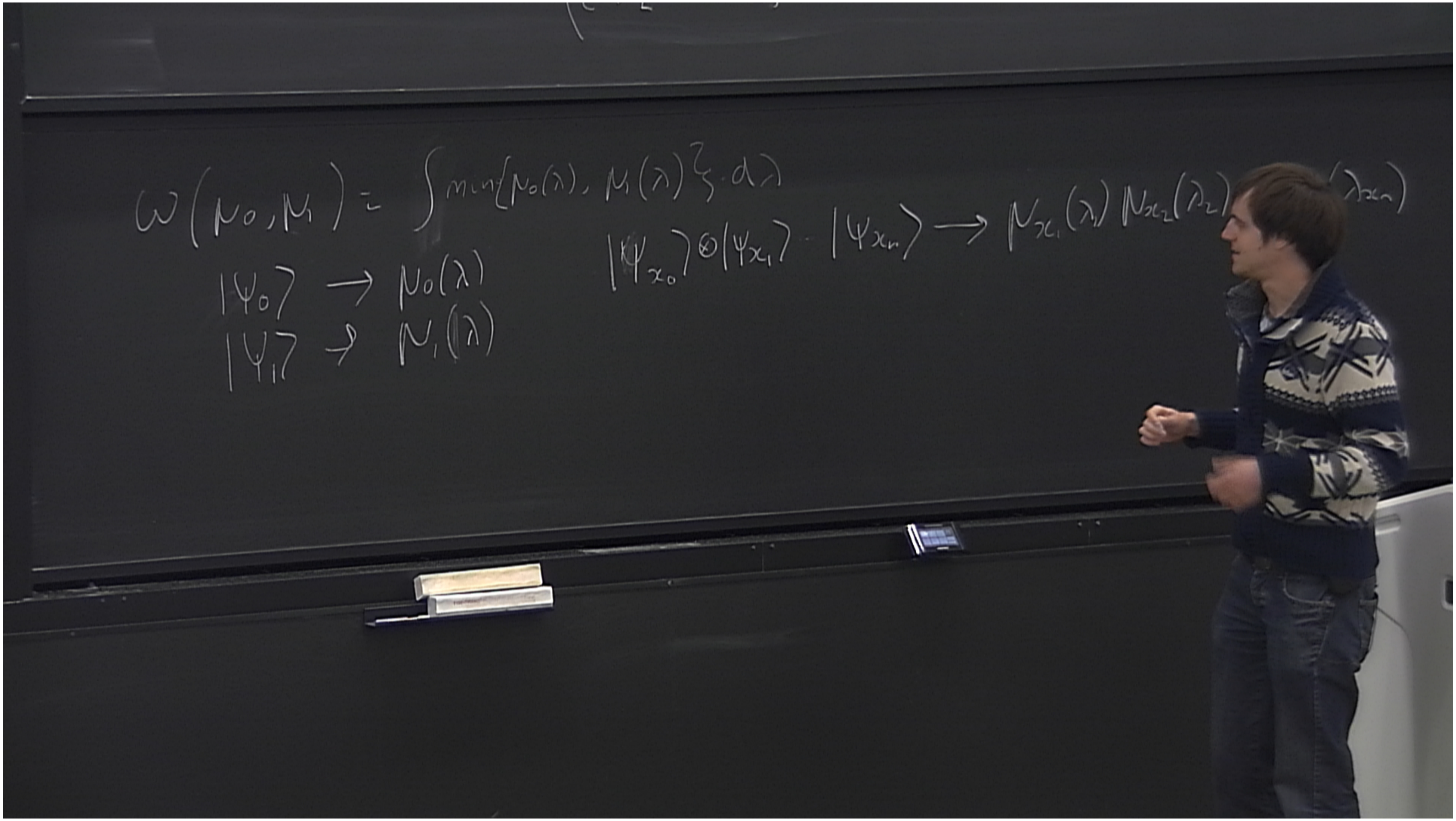
$$-\left(\cos\frac{\theta}{2}\right)^{n}|00\dots0\rangle + \sum_{x\neq 0}$$

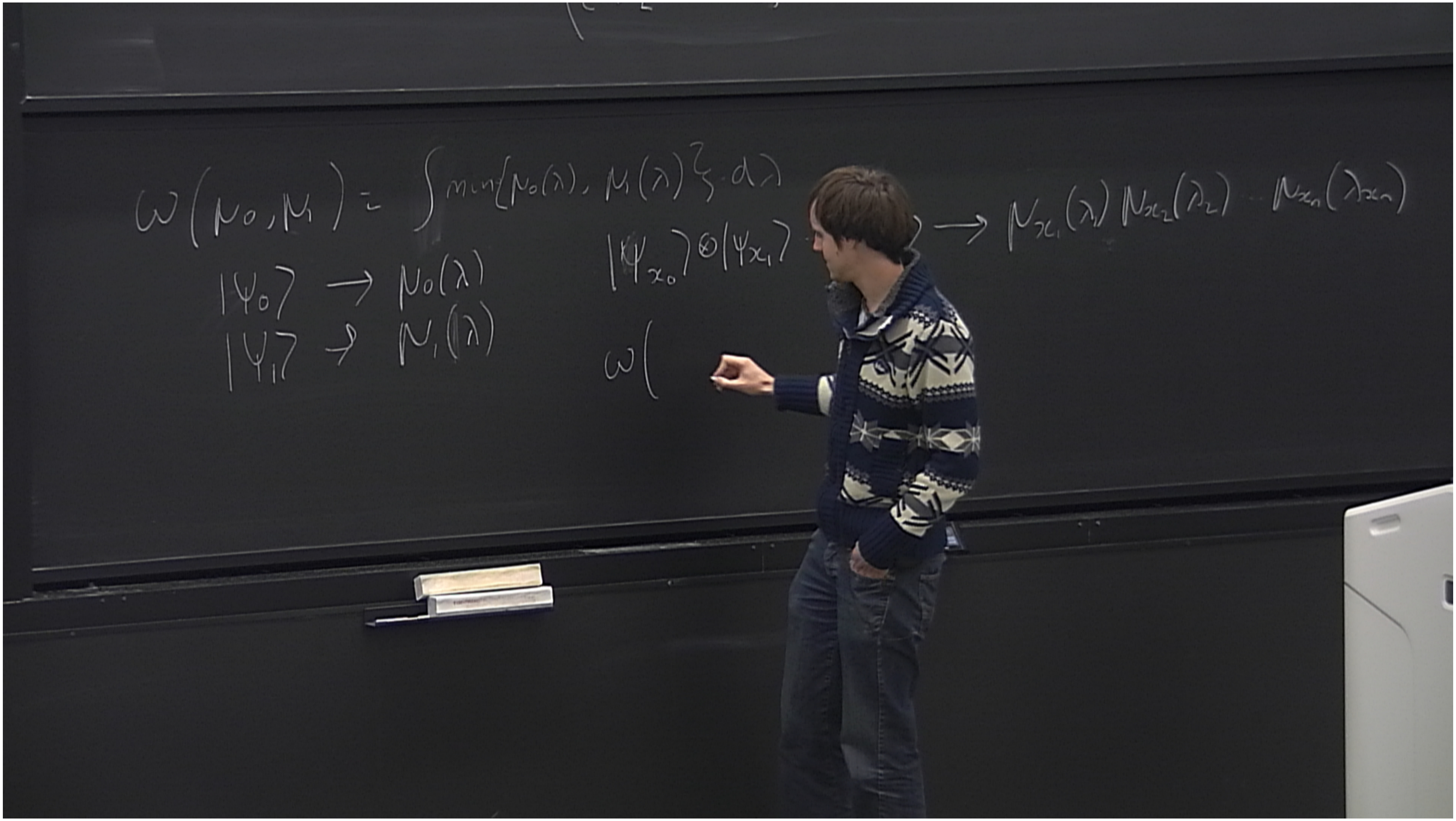


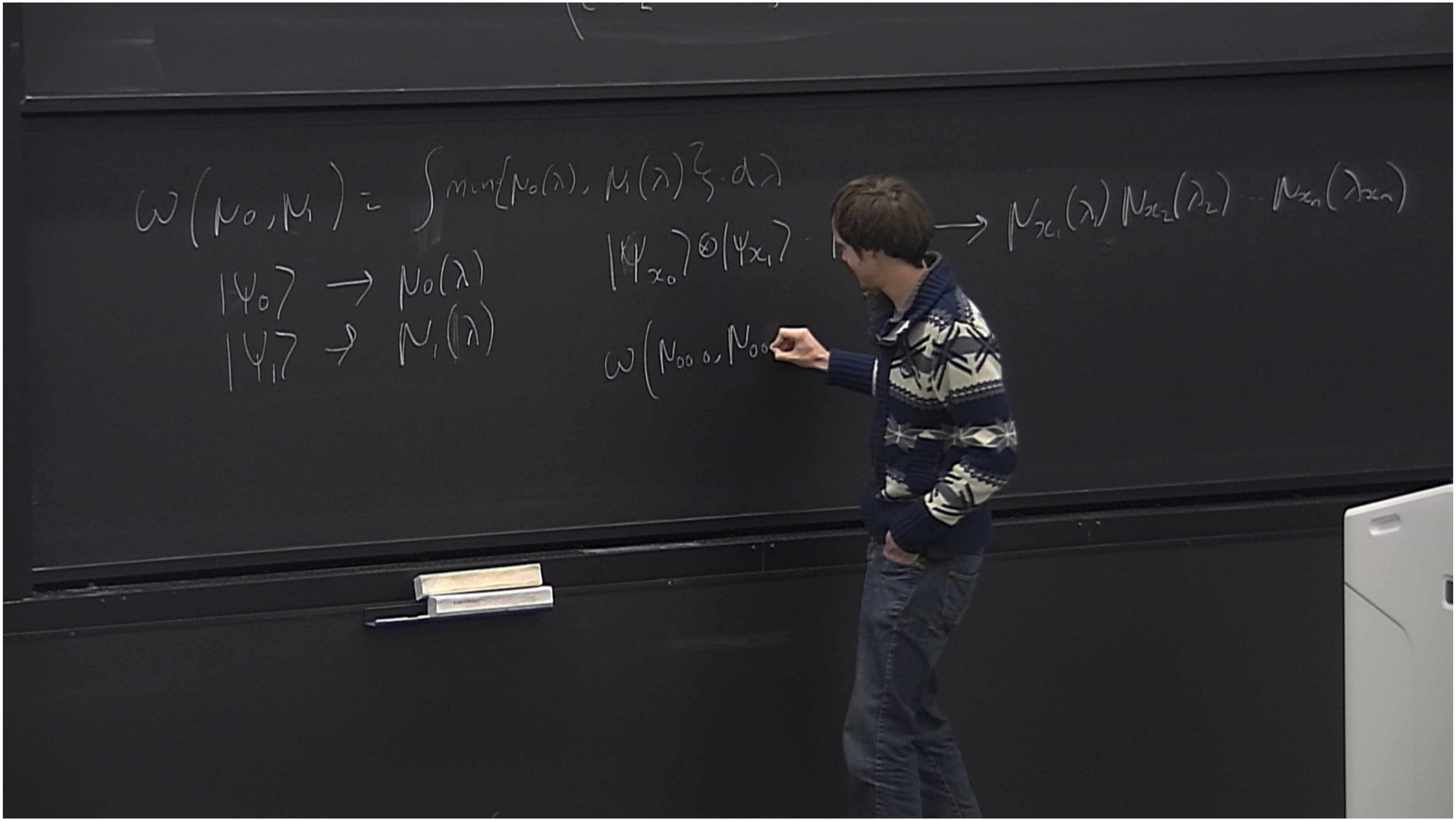

∫ min{μ0(λ), μ(λ)}·dλ

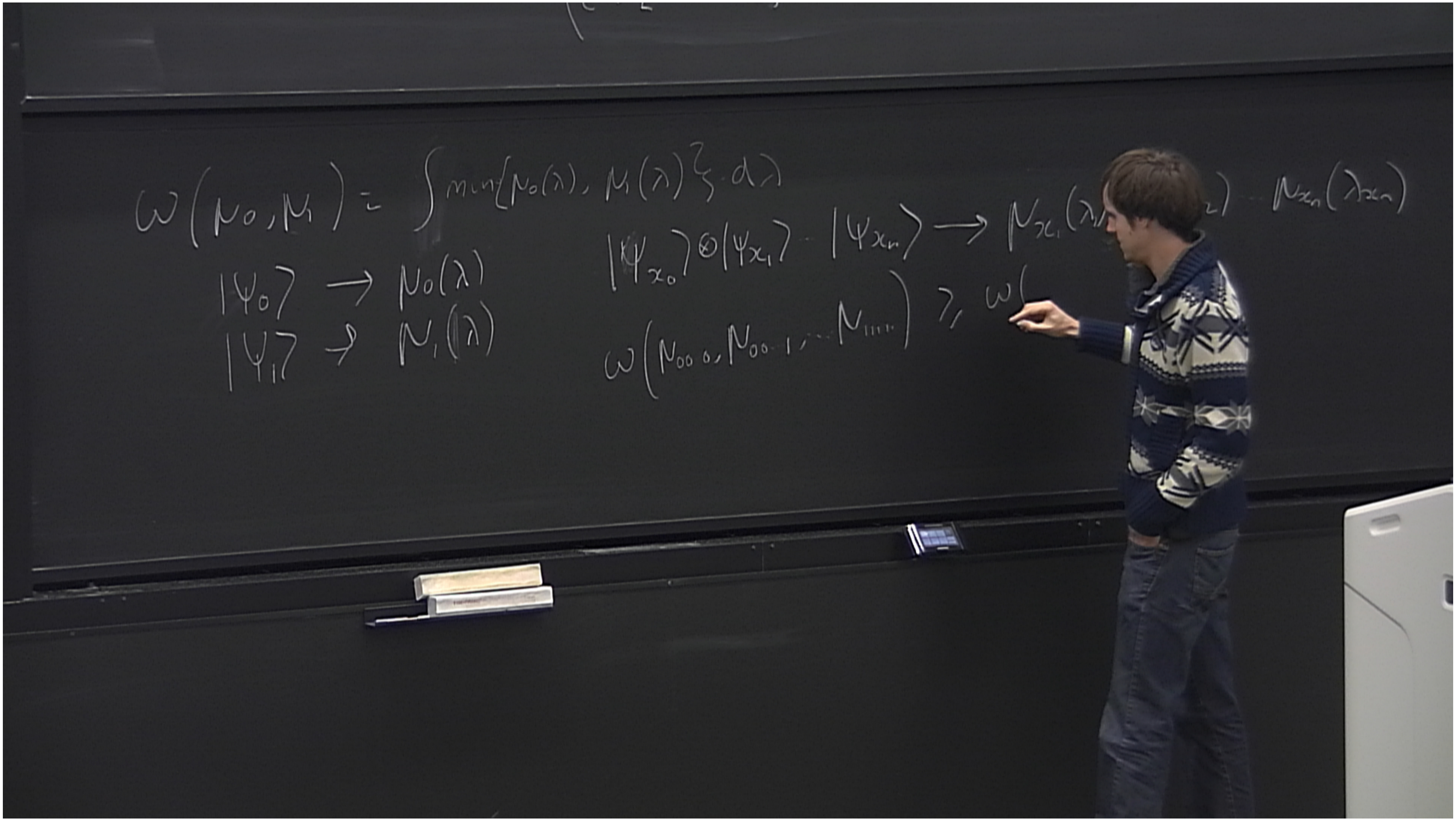

ω(μ0,μ1) = ∫min{μ0(λ), μ1(λ)}·dλ
|ψ0⟩ → μ0(λ)
|ψ1⟩ → μ1(λ)

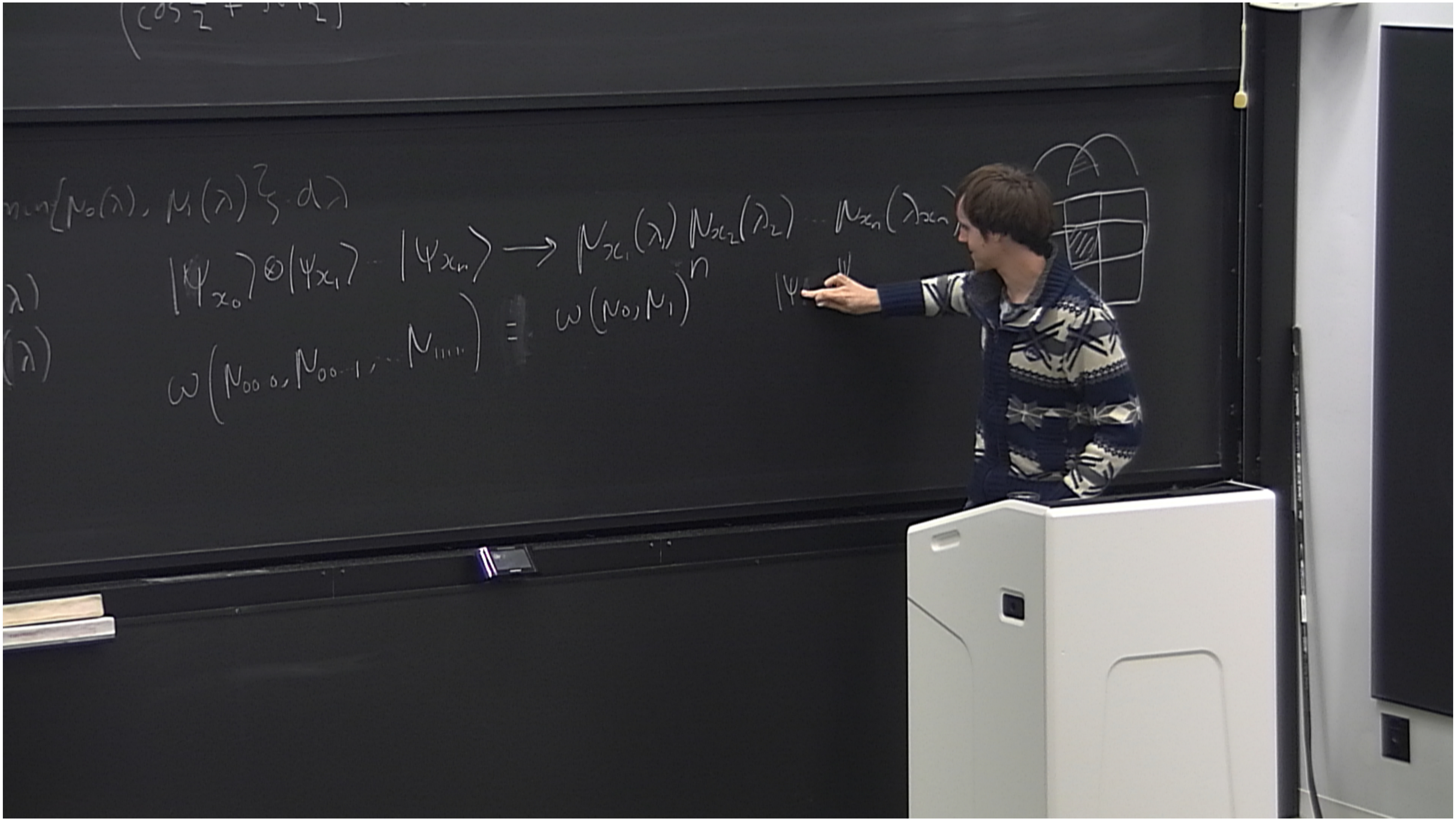

$\omega(\mu_0, \mu_1) = \int \min\{\mu_0(\lambda), \mu_1(\lambda)\} \cdot d\lambda$
$|\psi_0\rangle \to \mu_0(\lambda)$
$|\psi_1\rangle \to \mu_1(\lambda)$

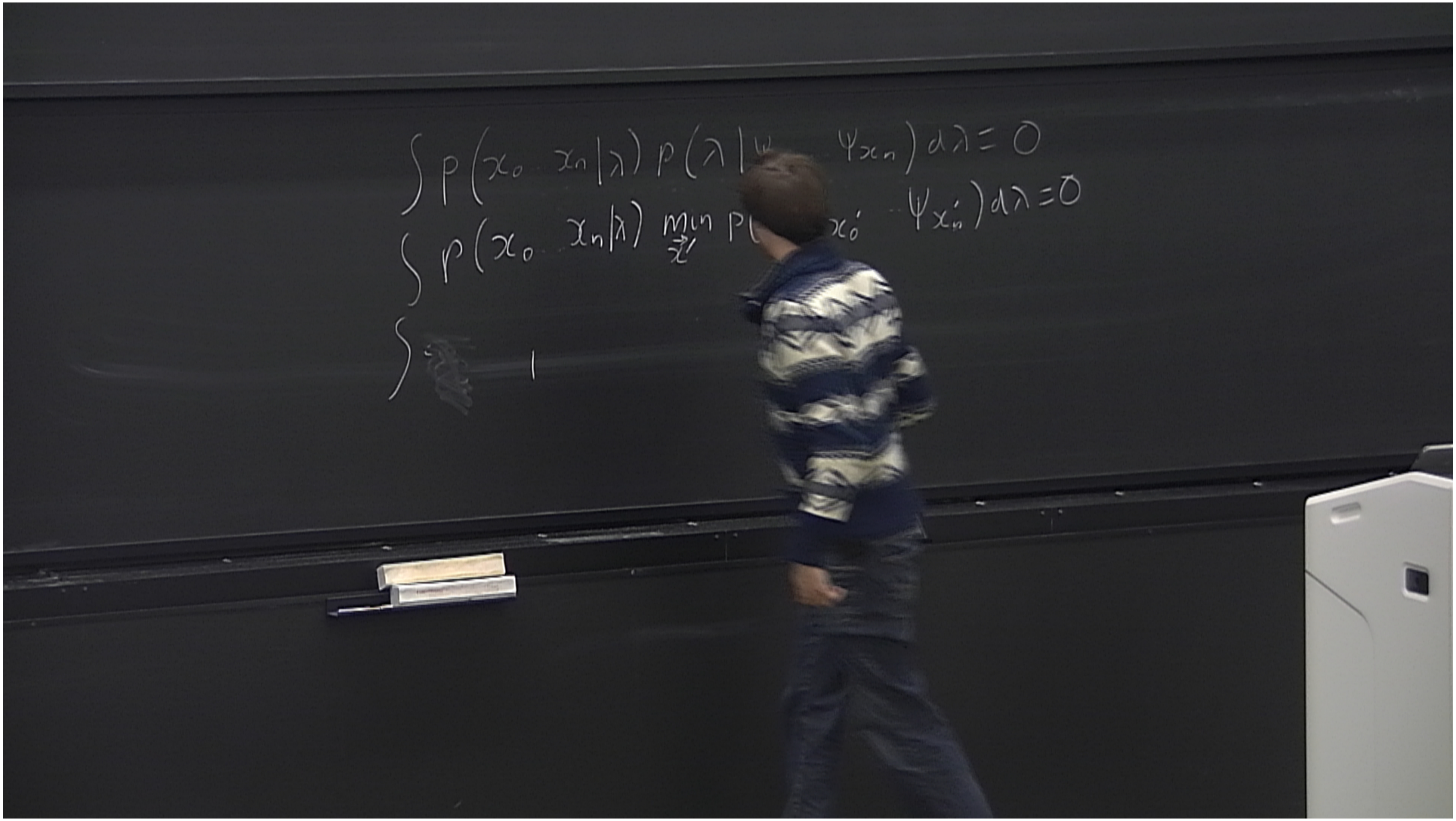

$\omega(\mu_0, \mu_1) = \int \min\{\mu_0(\lambda), \mu_1(\lambda)\} \cdot d\lambda$
$|\psi_0\rangle \to \mu_0(\lambda)$
$|\psi_1\rangle \to \mu_1(\lambda)$
$|\psi_{x_0}\rangle \otimes |\psi_{x_1}\rangle \cdot |\psi_{x_n}\rangle \longrightarrow \mu_{x_1}(\lambda_1)\, \mu_{x_2}(\lambda_2)$

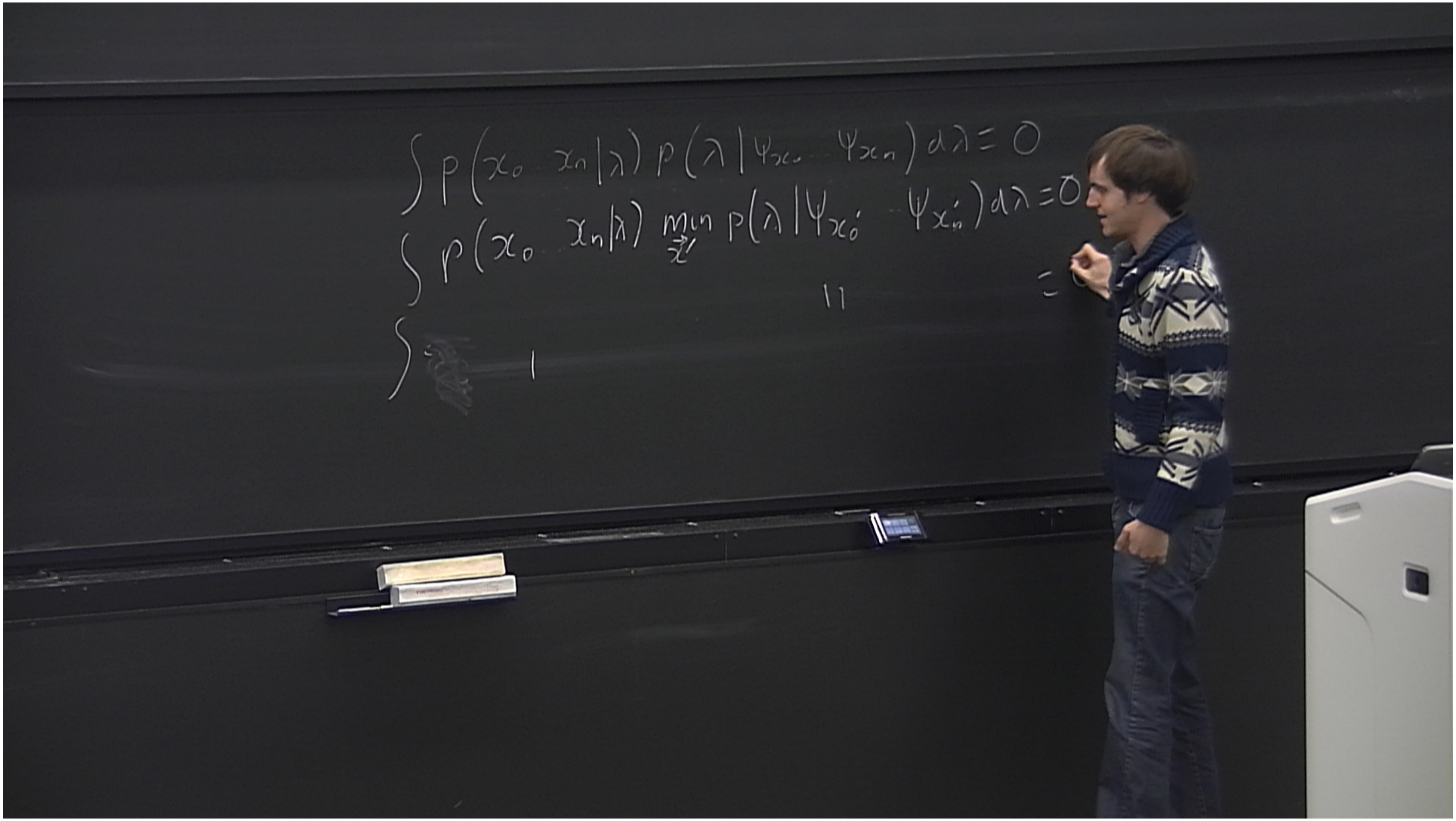

ω(μ0, μ1) = ∫ min{μ0(λ), μ1(λ)} dλ
|ψ0⟩ → μ0(λ)
|ψ1⟩ → μ1(λ)
|ψx0⟩ ⊗ |ψx1⟩
→ μx1(λ1) μx2(λ2) ... μxn(λxn)
ω(


ω(μ0, μ1) = ∫min{μ0(λ), μ1(λ)} dλ
|ψ0⟩ → μ0(λ)
|ψ1⟩ → μ1(λ)
|ψx0⟩ ⊗ |ψx1⟩ … → μx1(λ1) μx2(λ2) … μxn(λxn)
ω(μ00…0, μ00…


$\omega(\mu_0, \mu_1) = \int \min\{\mu_0(\lambda), \mu_1(\lambda)\} \, d\lambda$
$|\psi_0\rangle \rightarrow \mu_0(\lambda)$
$|\psi_1\rangle \rightarrow \mu_1(\lambda)$
$|\psi_{x_0}\rangle \otimes |\psi_{x_1}\rangle \cdots |\psi_{x_n}\rangle \longrightarrow \mu_{x_1}(\lambda_1) \cdots \mu_{x_n}(\lambda_{x_n})$
$\omega(\mu_{00\cdots0}, \mu_{00\cdots1}, \ldots \mu_{11\cdots1}) \geq \omega($




∫ p(x_0 … x_n | λ) p(λ | ψ … ψx_n) dλ = 0
∫ p(x_0 … x_n | λ) min p(… x_0' … ψx_n') dλ = 0


$\int p(x_0 \dots x_n|\lambda)\, p(\lambda|\psi_{x_0} \dots \psi_{x_n})\, d\lambda = 0$
$\int p(x_0 \dots x_n|\lambda) \min_{\vec{x}'} p(\lambda|\psi_{x_0'} \dots \psi_{x_n'})\, d\lambda = 0$