Title: Exploring N=1 theories of class S through Higgsing, dualizing and twisting

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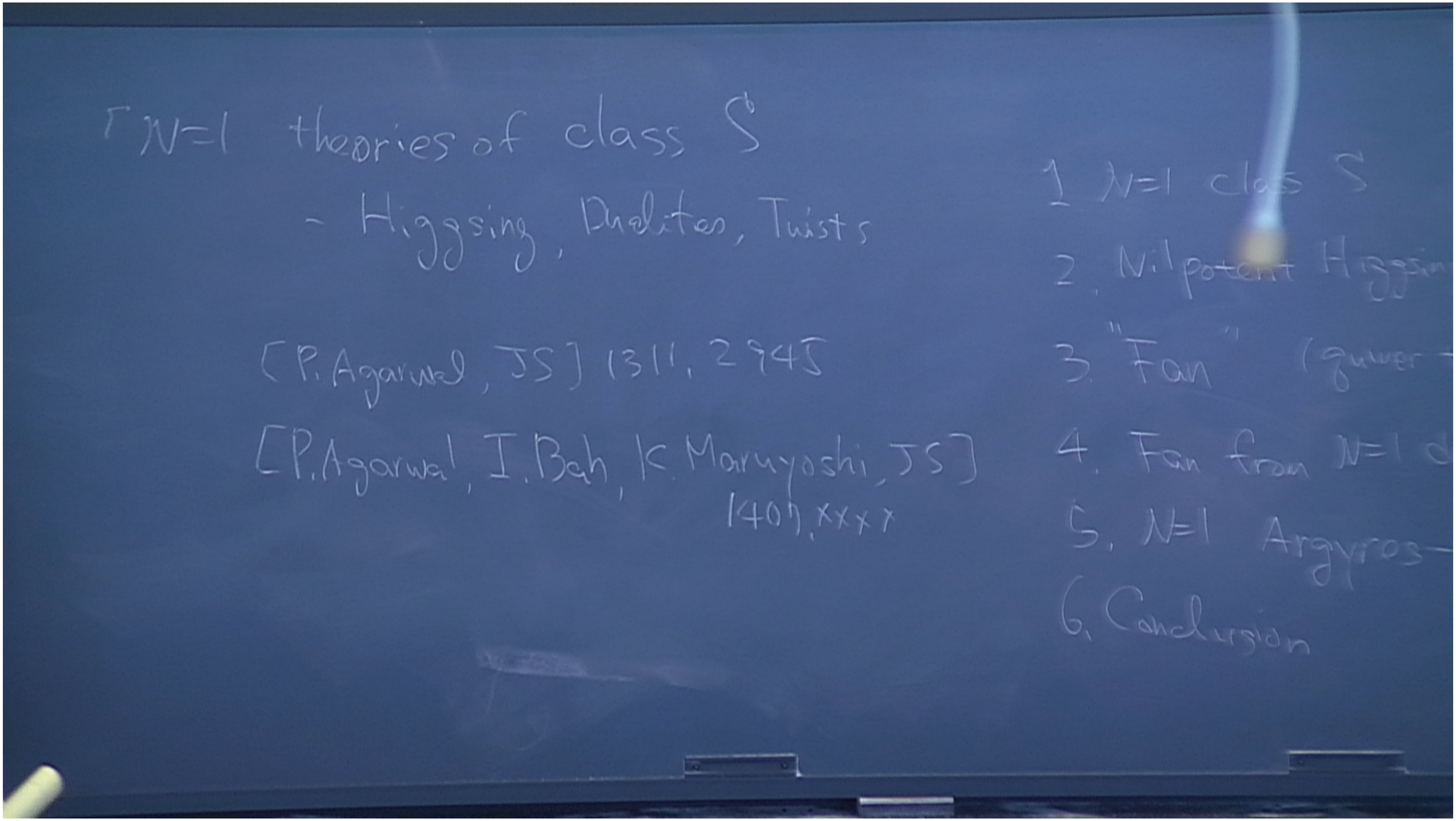
Abstract: We study a class of 4d N=1 SCFTs obtained from partial compactifications of 6d N=(2, 0) theory on a Riemann surface with punctures. We identify theories corresponding to curves with general type of punctures through nilpotent Higgsing and Seiberg dualities. The `quiver tails' of N=1 class S theories turn out to differ significantly from N=2 counterpart and have interesting properties. Various dual descriptions for such a theory can be found by using colored pair-of-pants decompositions. Especially, we find N=1 analog of Argyres-Seiberg duality for the SQCD with various gauge groups. We compute anomaly coefficients and superconformal indices to verify our proposal.


N=1 theories of class S
- Higgsing, Dualities, Twists
[P. Agarwal, JS] 1311.2945
[P. Agarwal, I. Bah, K. Maruyoshi, JS]
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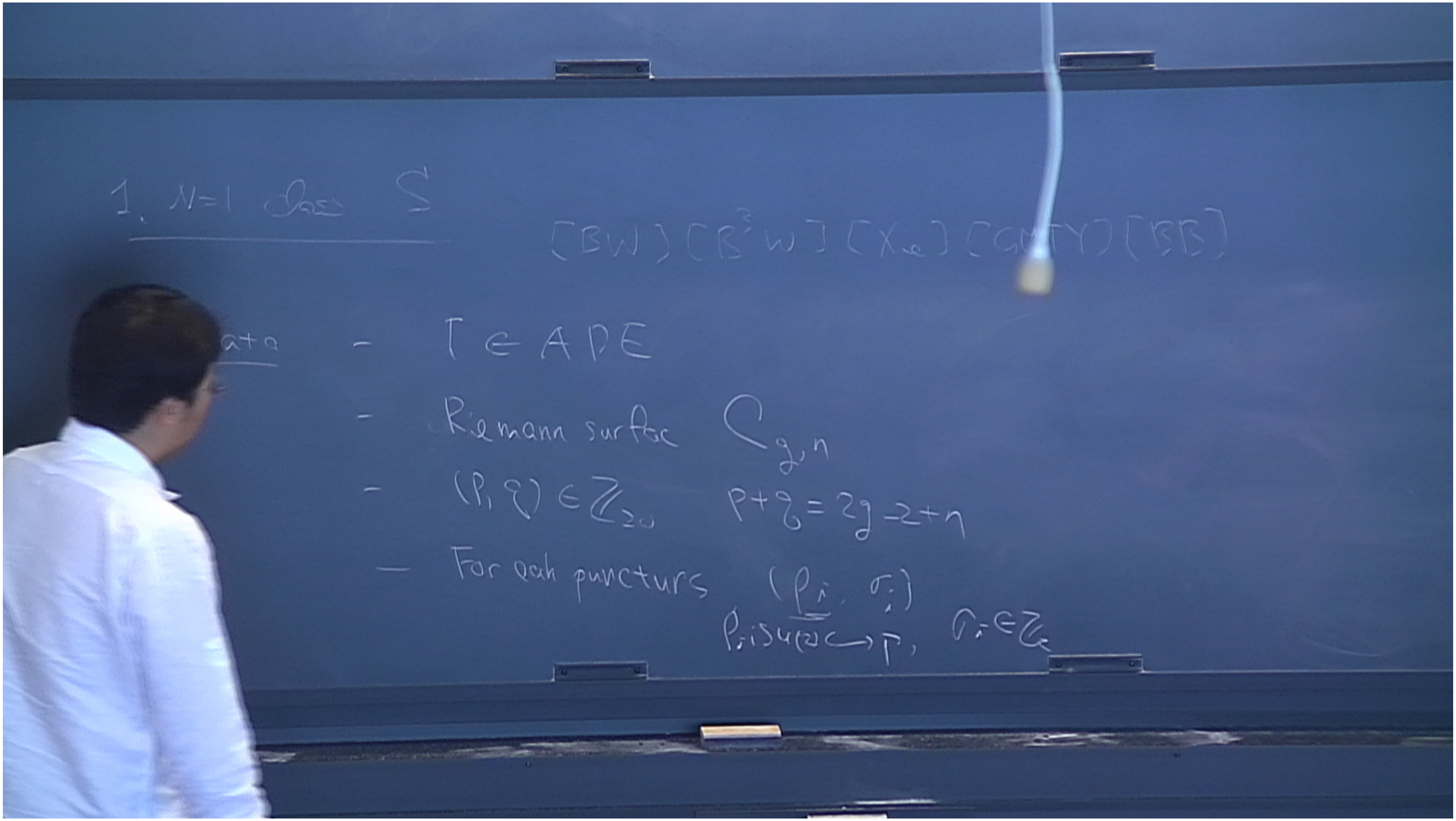
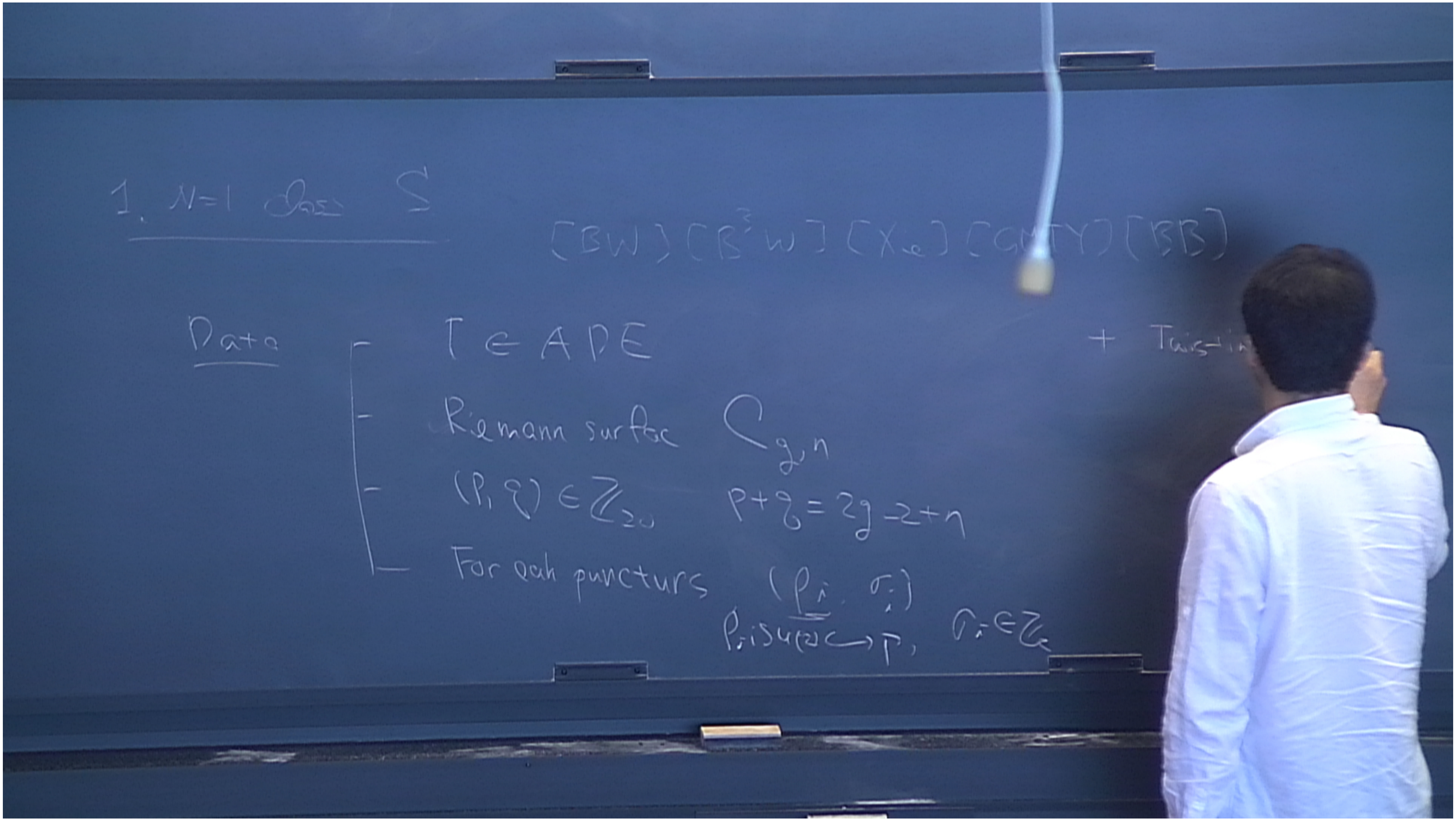
1 N=1 class S
2. Nilpotent Higgsing
3. "Fan"
4. Fan from N=1
5. N=1 Argyros
6. Conclusion


1. N=1 class S
[BW] [B3W] [Xie] [GMTY] [BB]
ata
- Γ ∈ ADE
- Riemann surface C g,n
- (p, q) ∈ Z≥0   p+q = 2g-2+n
- For each puncture (ρi, σi)
ρi: SU(2) ↪ Γ, σi ∈ Z2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Data
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+ Twistin
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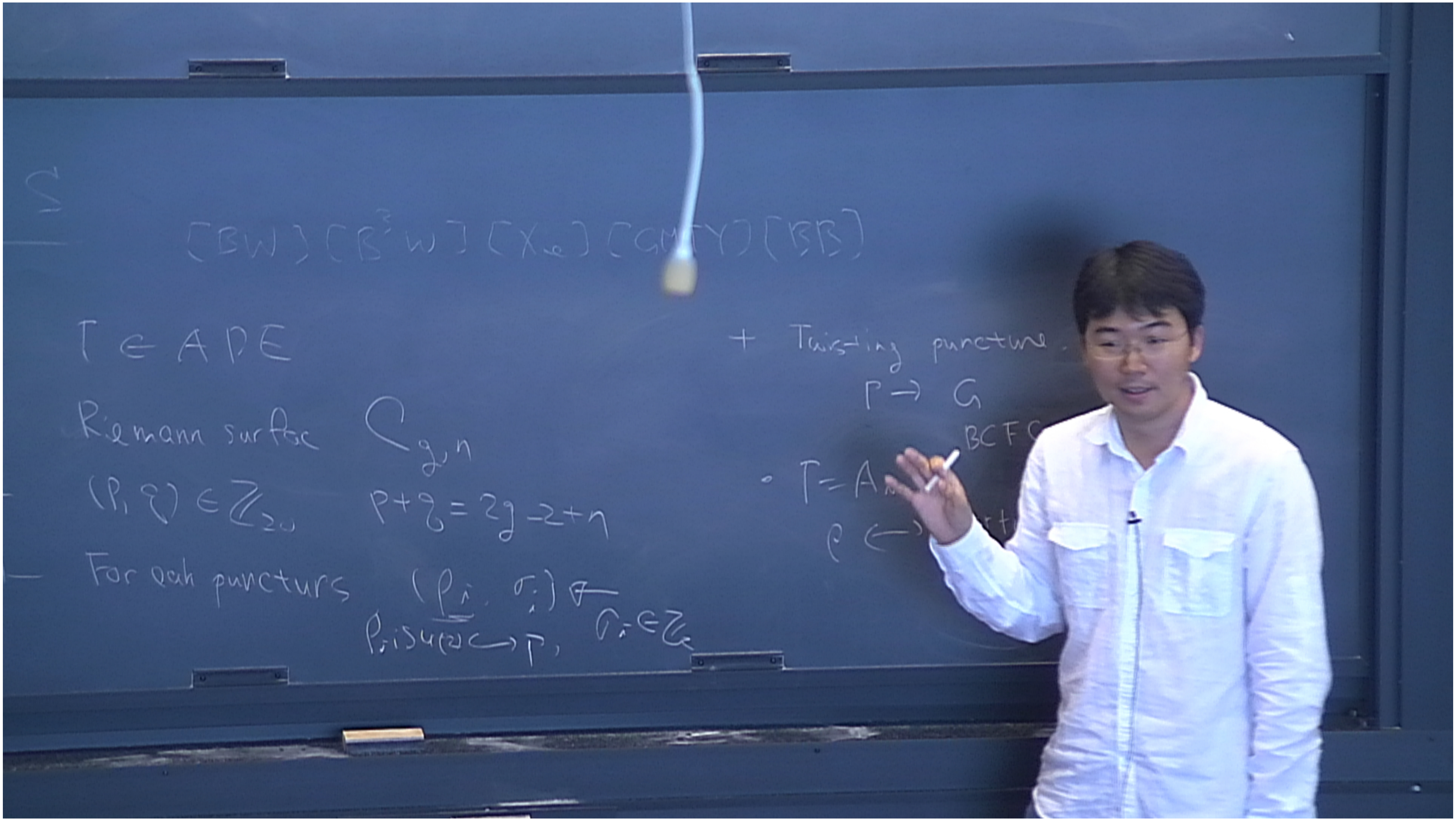
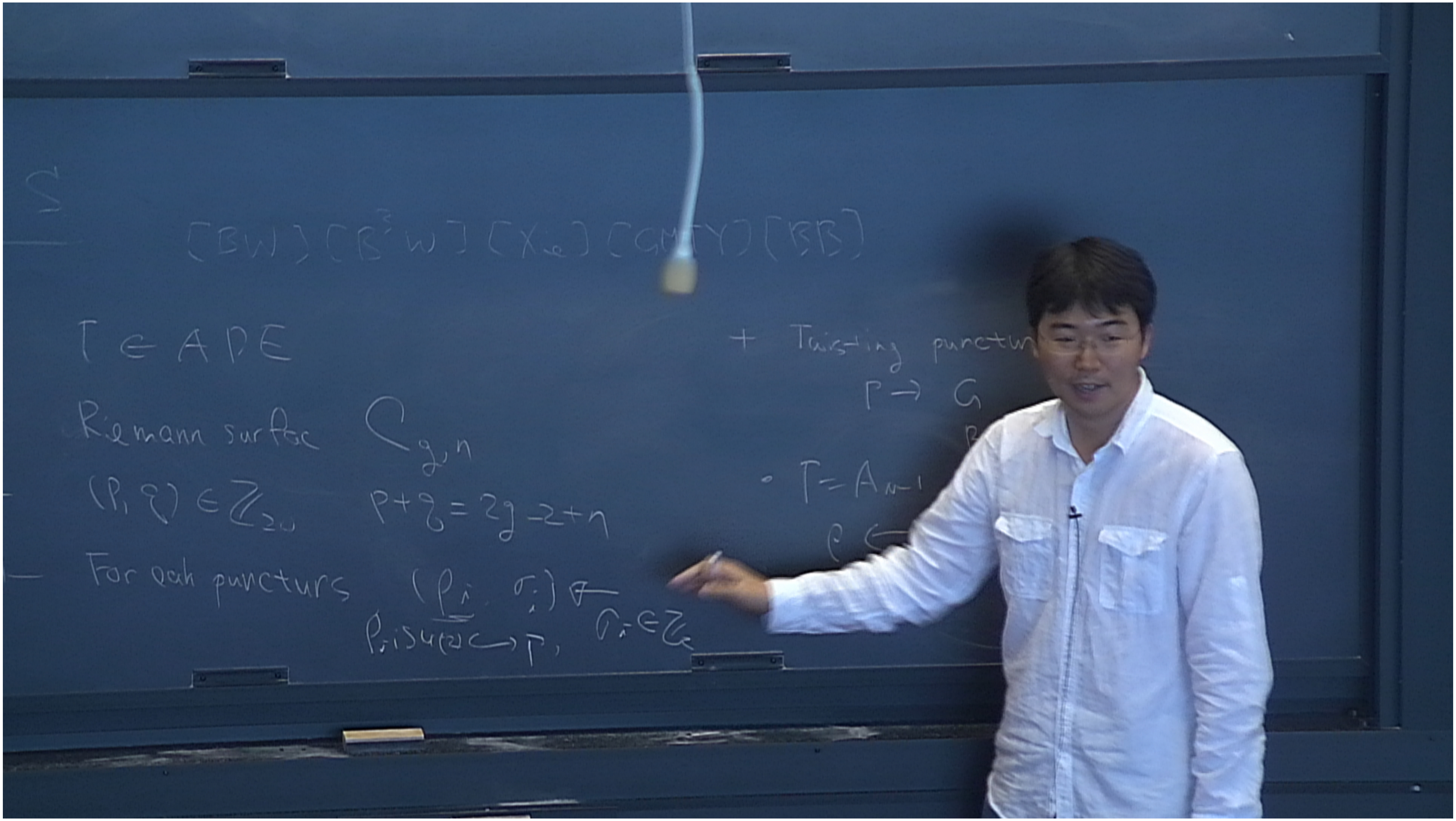
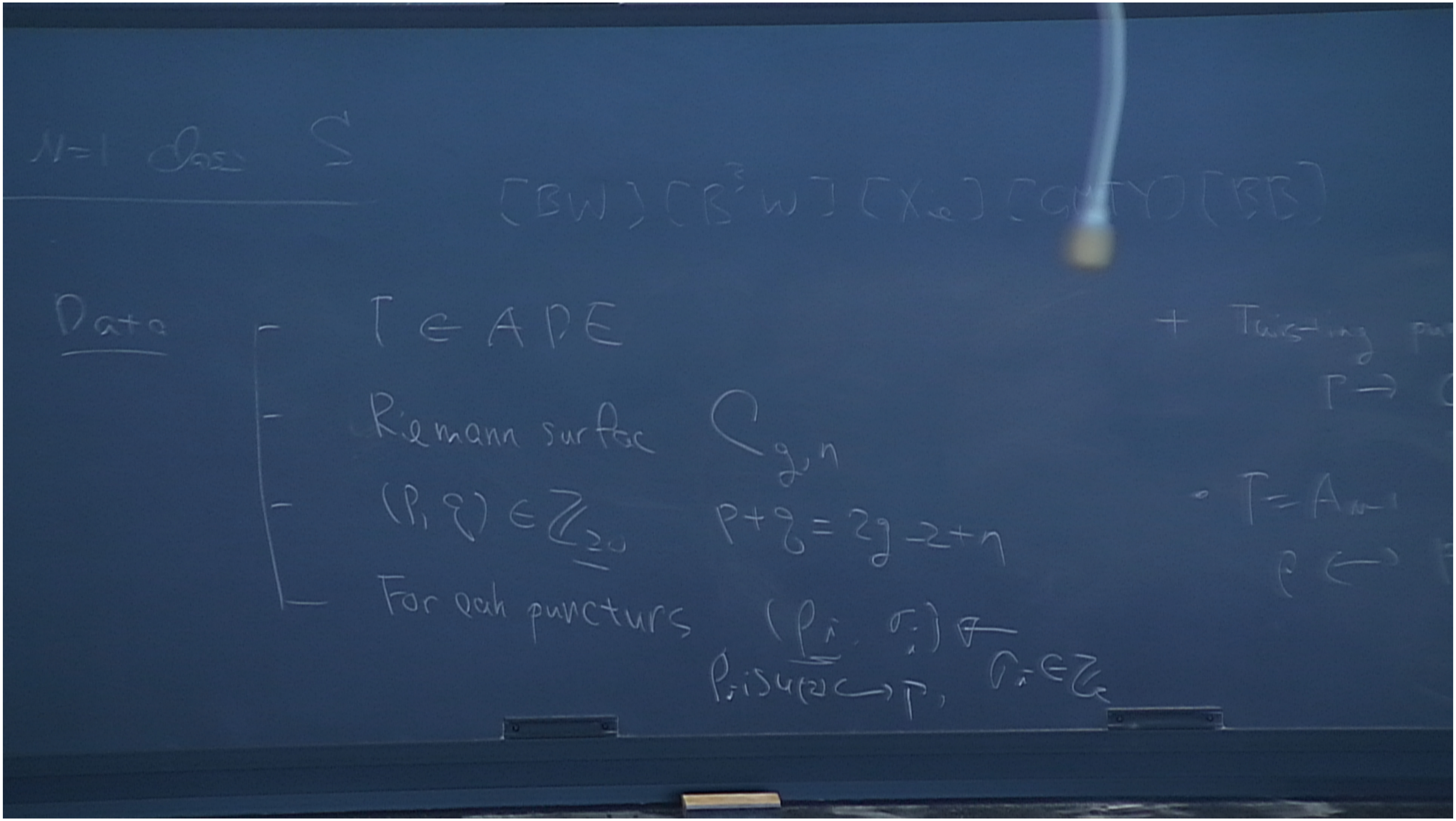


Γ ∈ ADE
Riemann surface C g,n
p+q = 2g-2+n
For each puncture
+ Twisting puncture


Γ ∈ ADE
+ Twisting puncture
Riemann surface
p + q = 2g − 2 + n
For each puncture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For each puncture (ρ_i, σ_i) ∈
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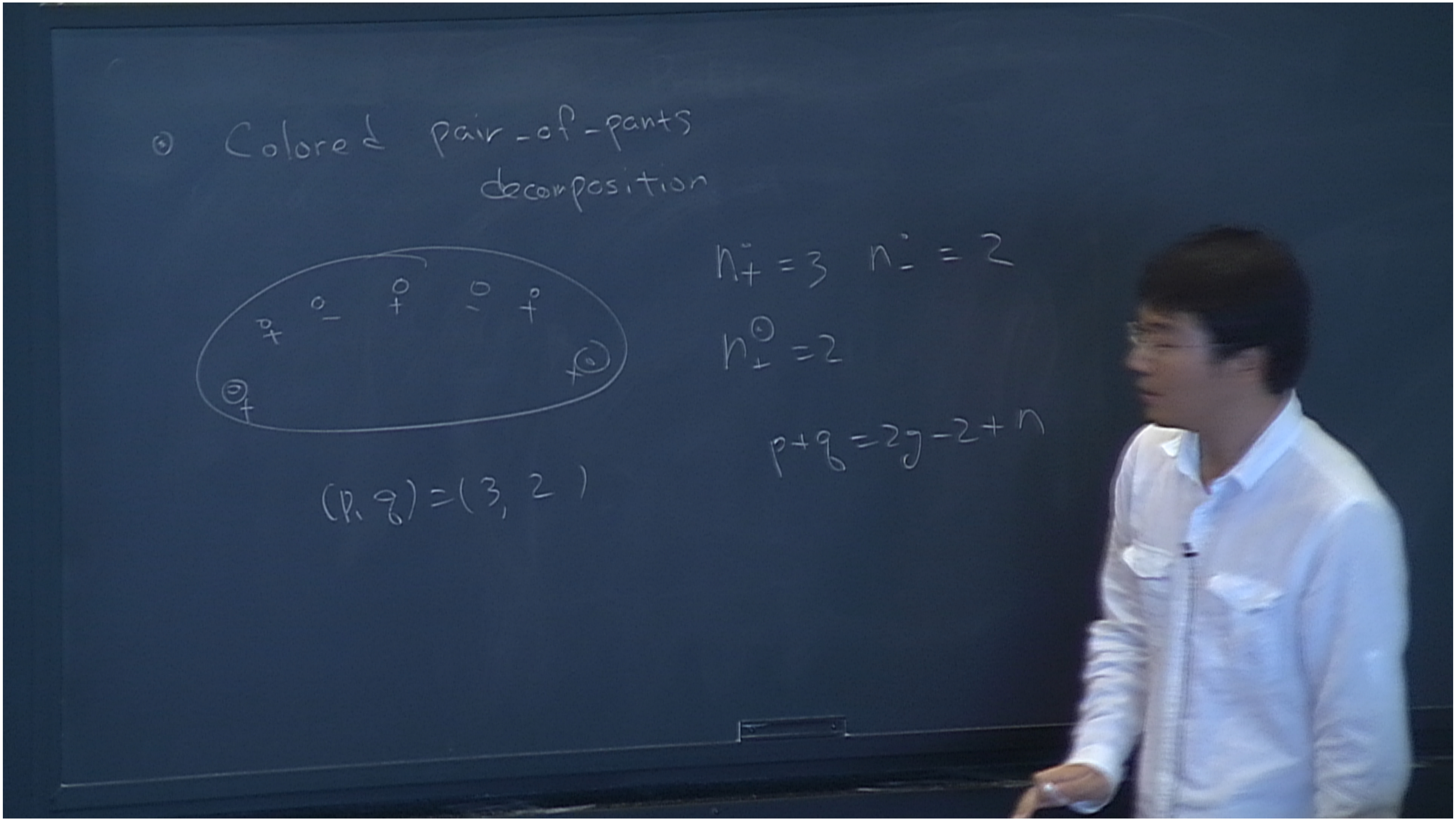
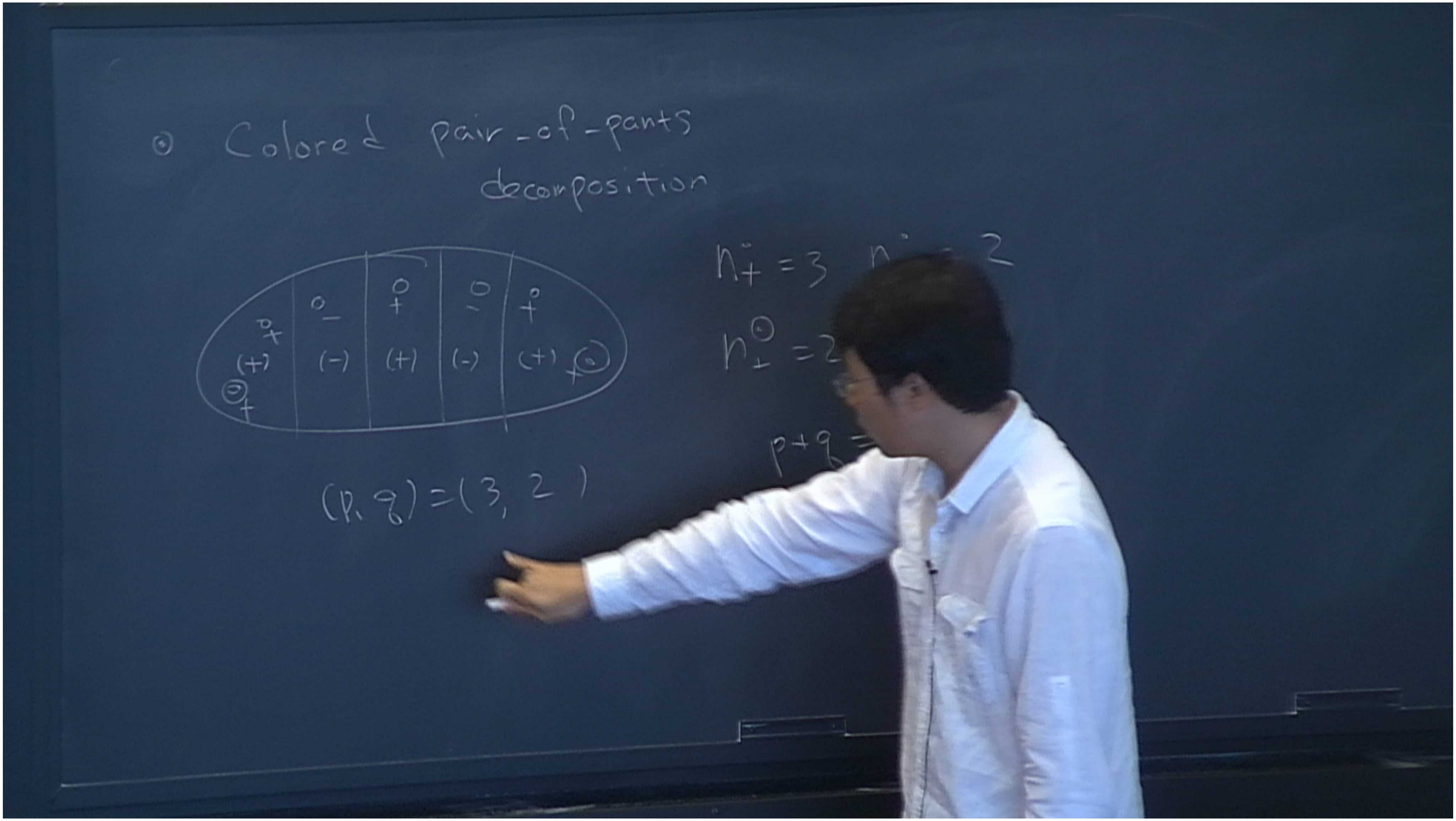
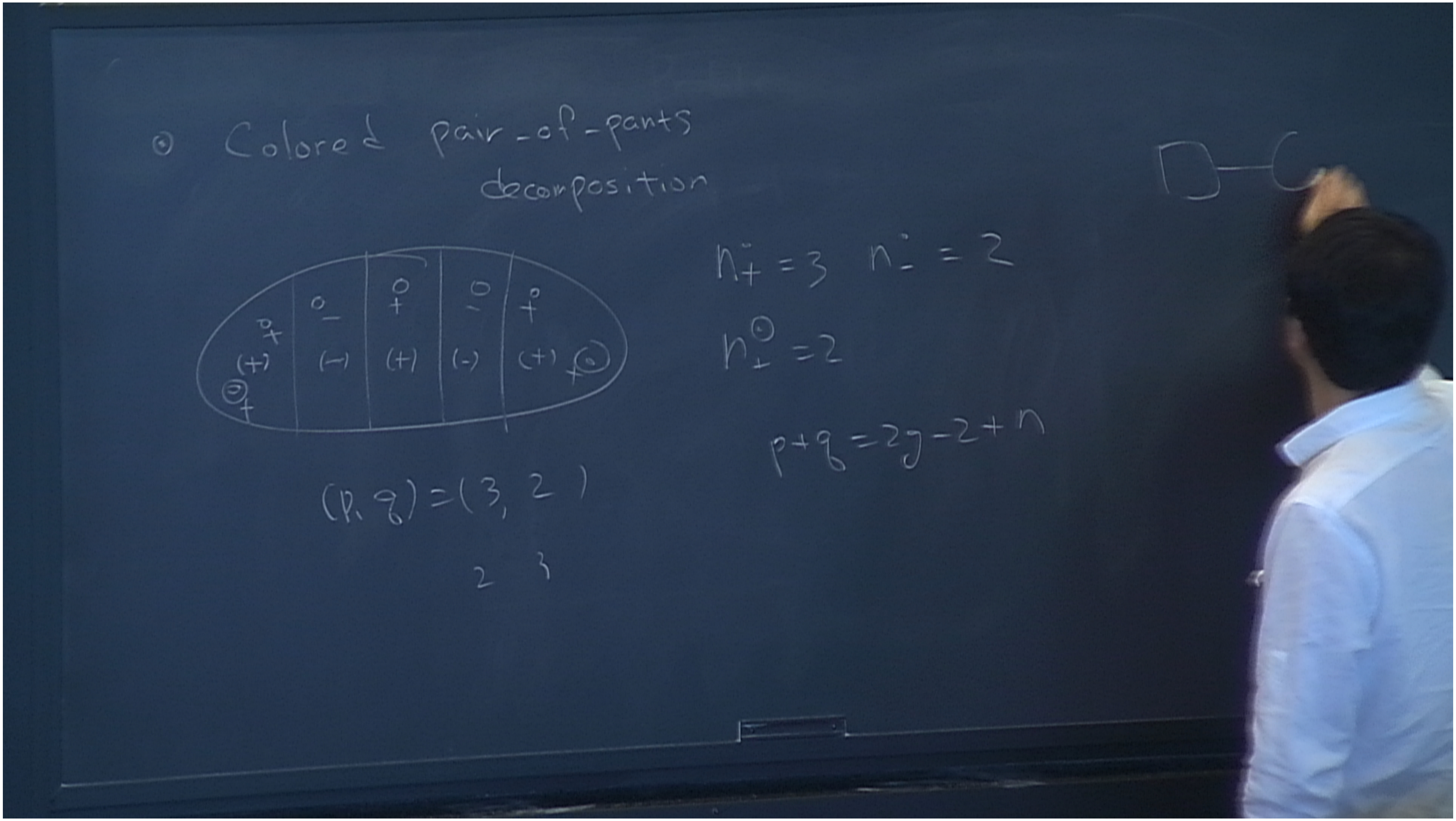
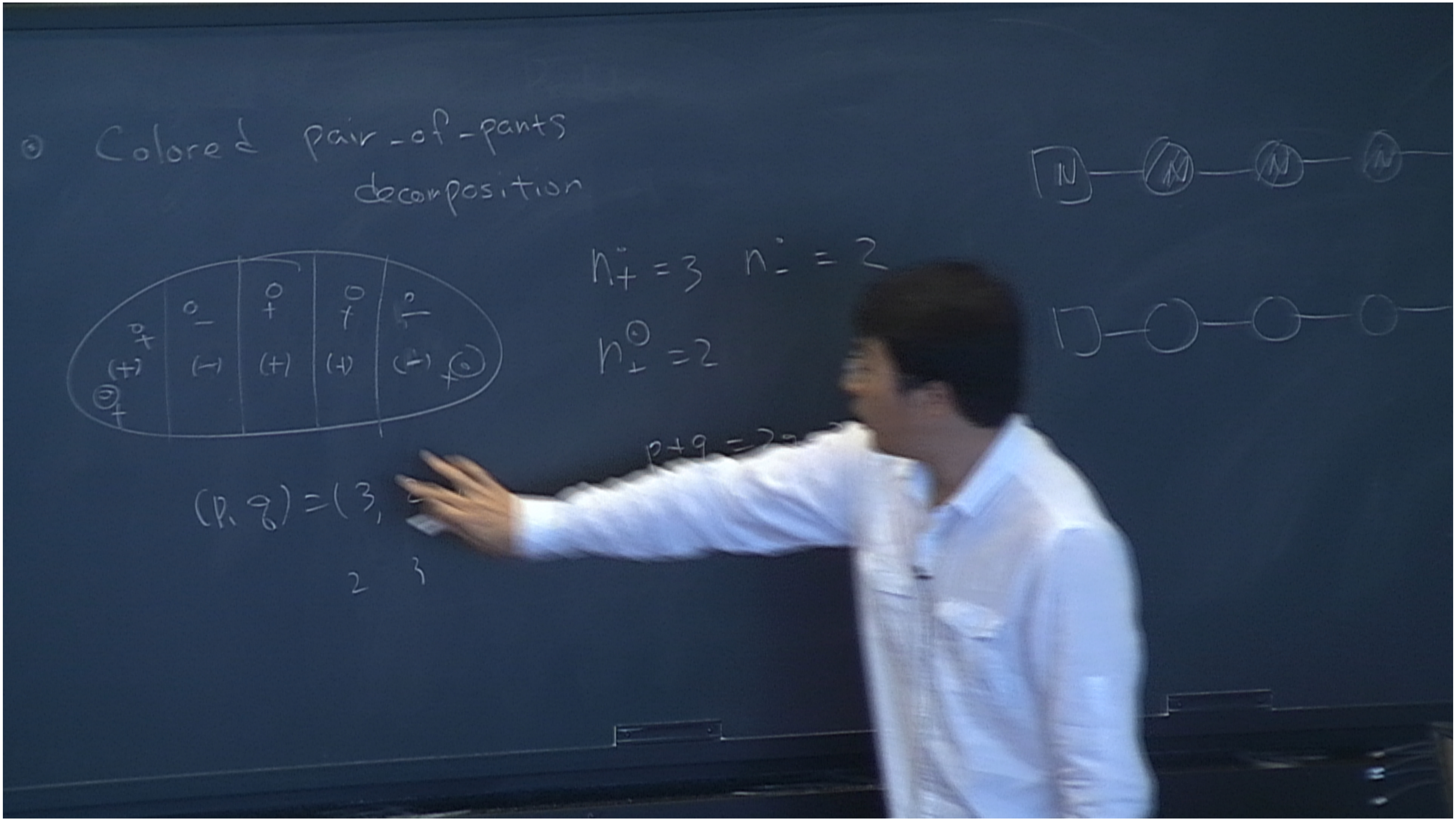
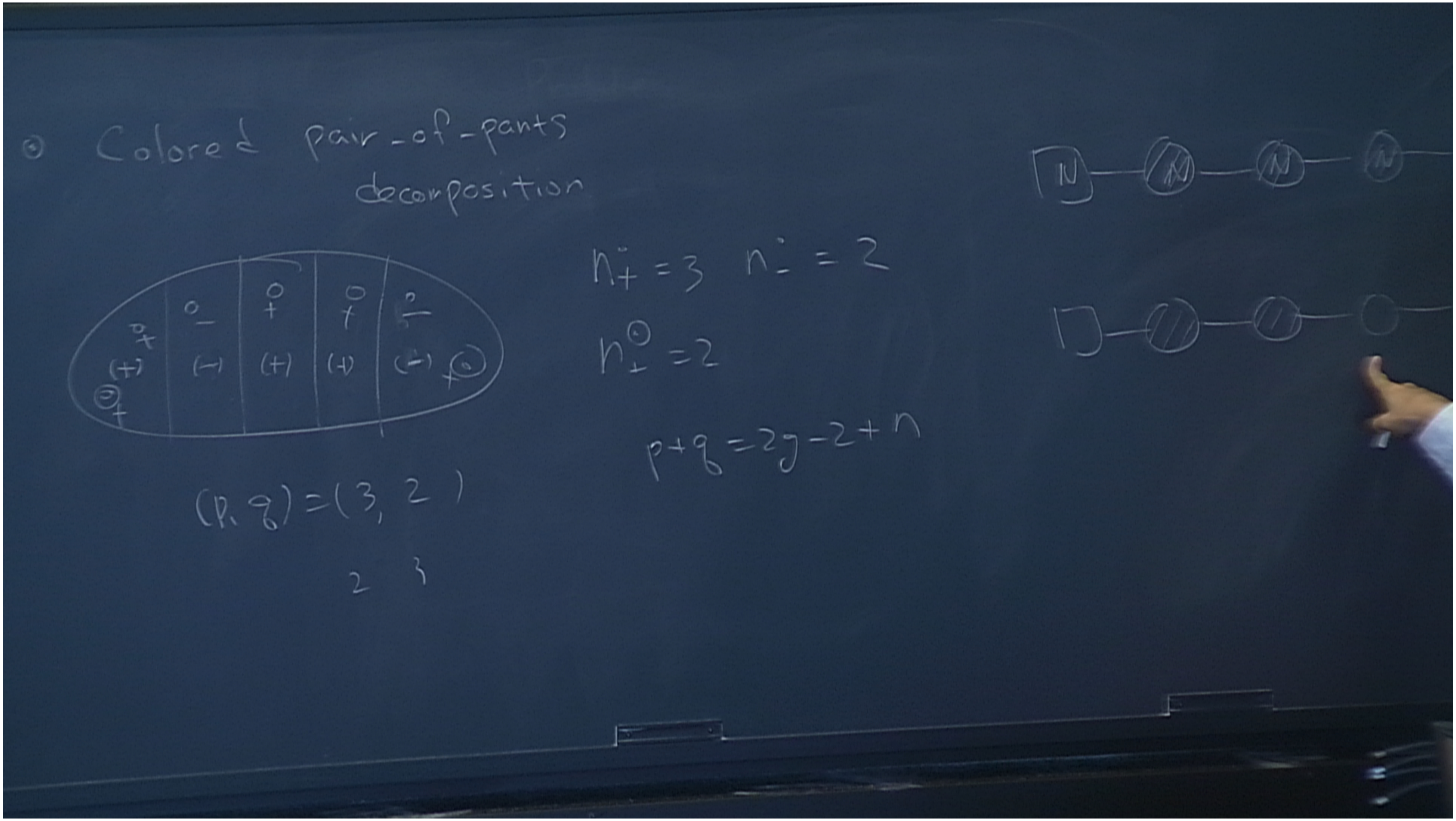
+ Twisting
Γ = A_{N-1}

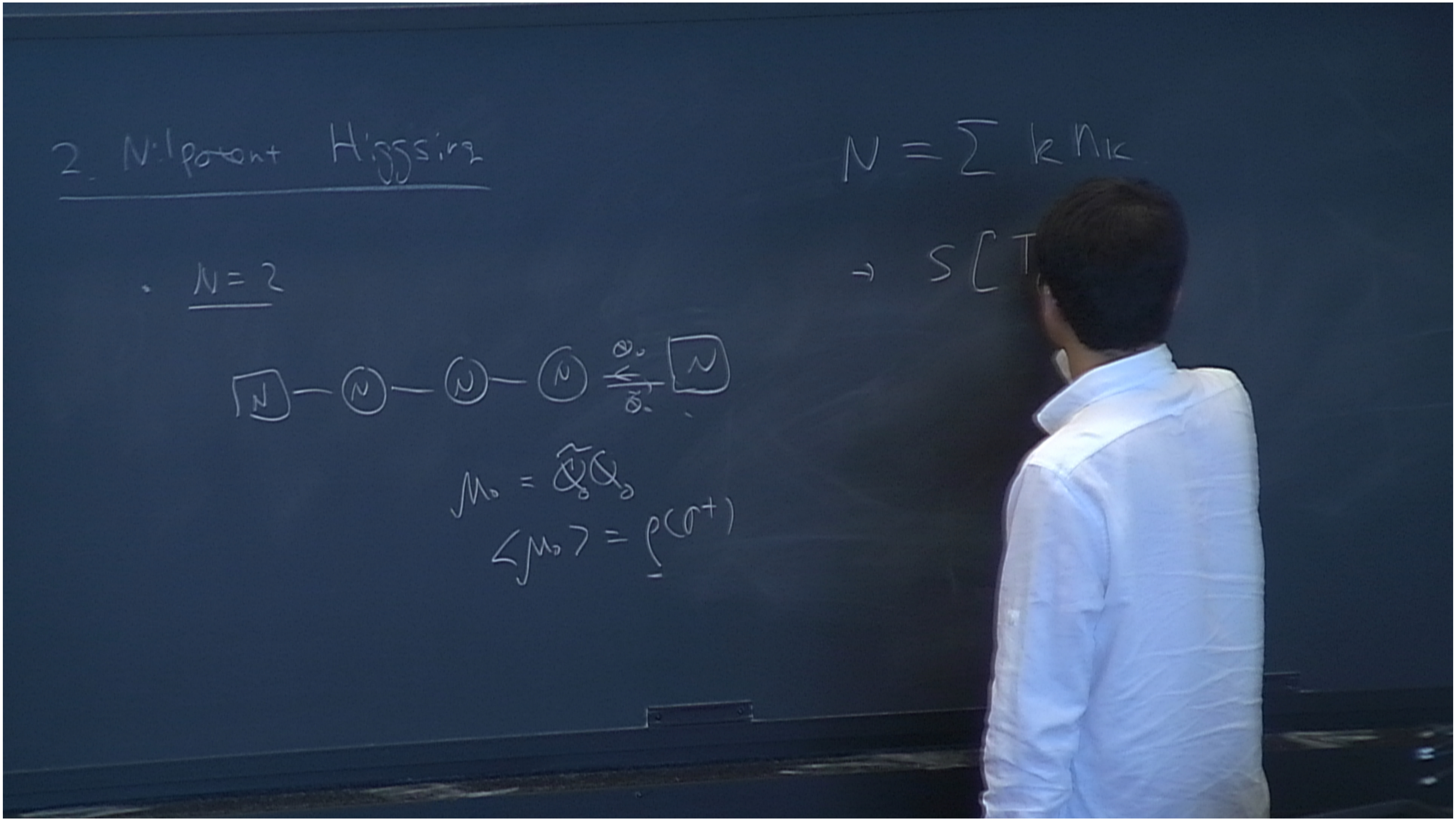

Colored pair-of-pants
decomposition
(p, q) = (3, 2)
p+q = 2g-2+n


Colored pair-of-pants decomposition
(+) (−) (+) (−) (+)
(p, q) = (3, 2)
p+q =


Colored pair-of-pants decomposition
(+) (−) (+) (−) (+)
n₊ = 3 n₋ = 2
n = 2
p+q = 2g−2+n
(p, q) = (3, 2)
2 3

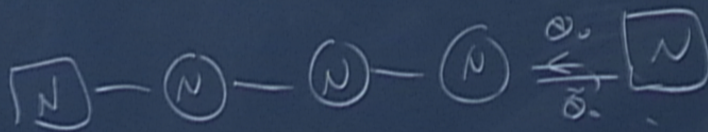

Colored pair-of-pants decomposition
(p, q) = (3,


Colored pair-of-pants decomposition
$n^{\circ}_{+} = 3 \quad n^{\circ}_{-} = 2$
$n^{\ominus}_{+} = 2$
$p+q = 2g-2+n$
$(p, q) = (3, 2)$
2 3
N


2. Nilpotent Higgsing
N = Σ k n_k
N = 2
μ₀ = Q̃₀ Q₀
<μ₀> = ρ(σ⁺)

2. Nilpotent Higgsing

- $N = 2$

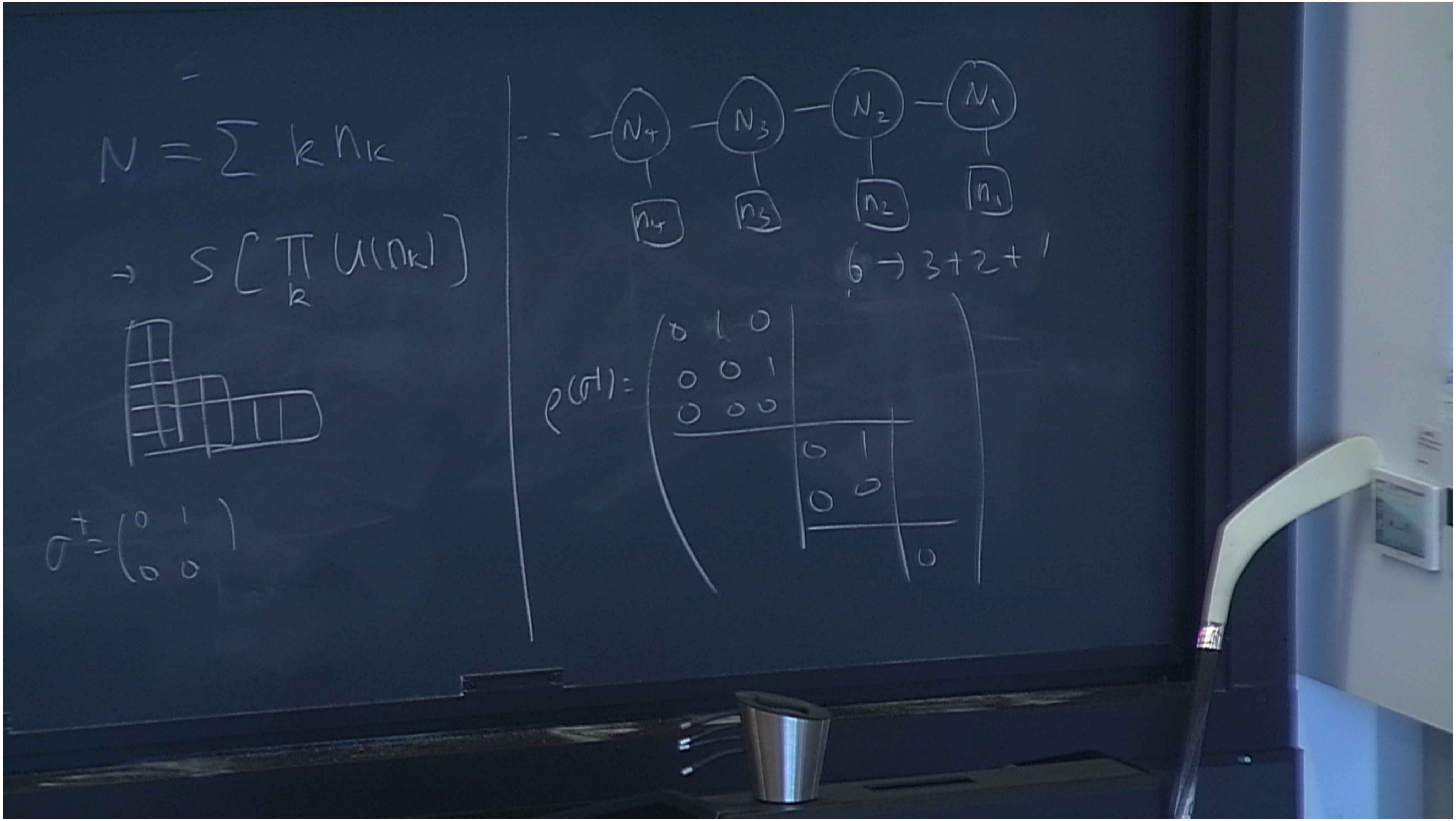


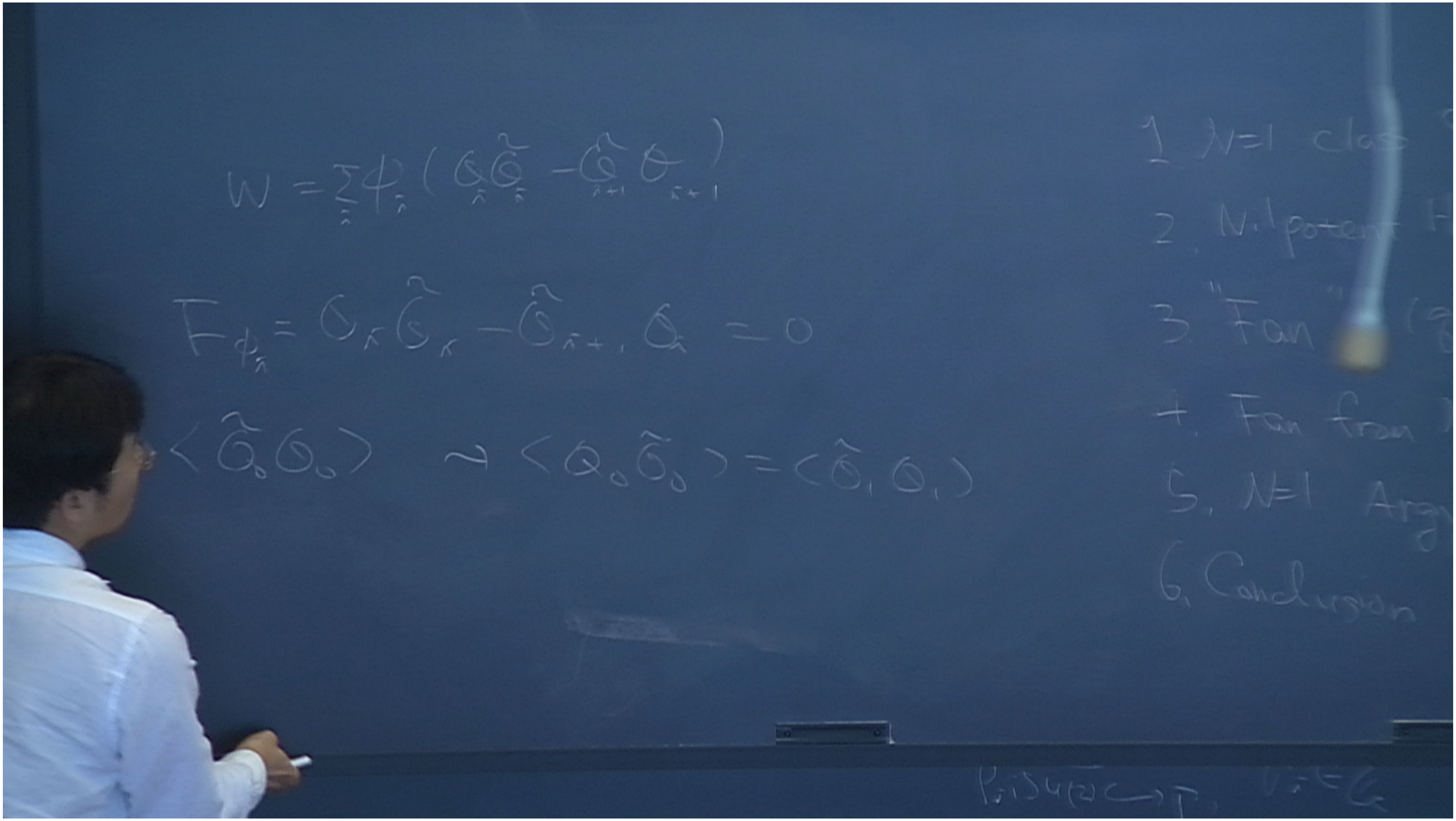
$$\mu_0 = \tilde{Q}_0 Q_0$$

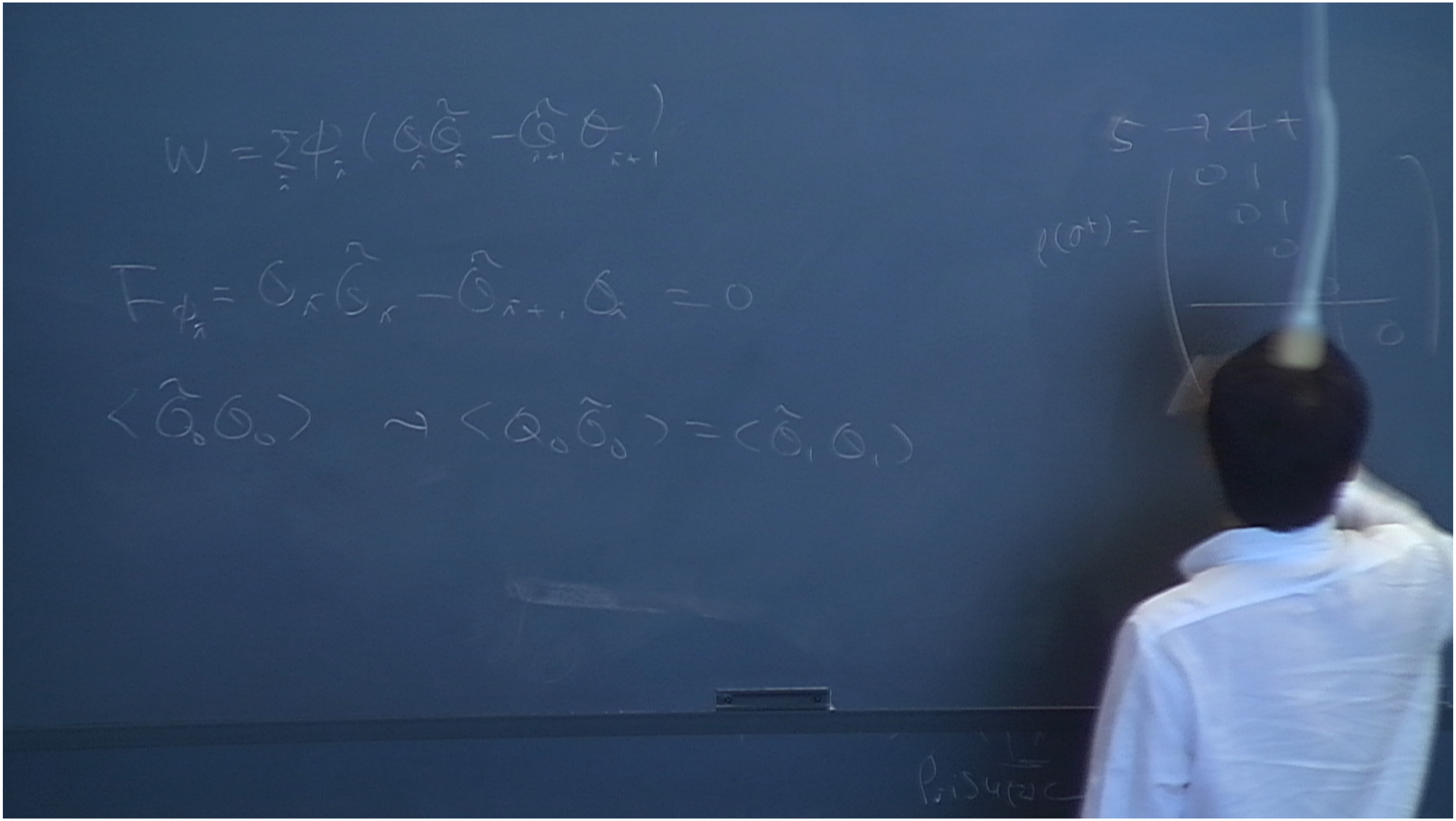
$$\langle \mu_0 \rangle = \rho(\sigma^+)$$

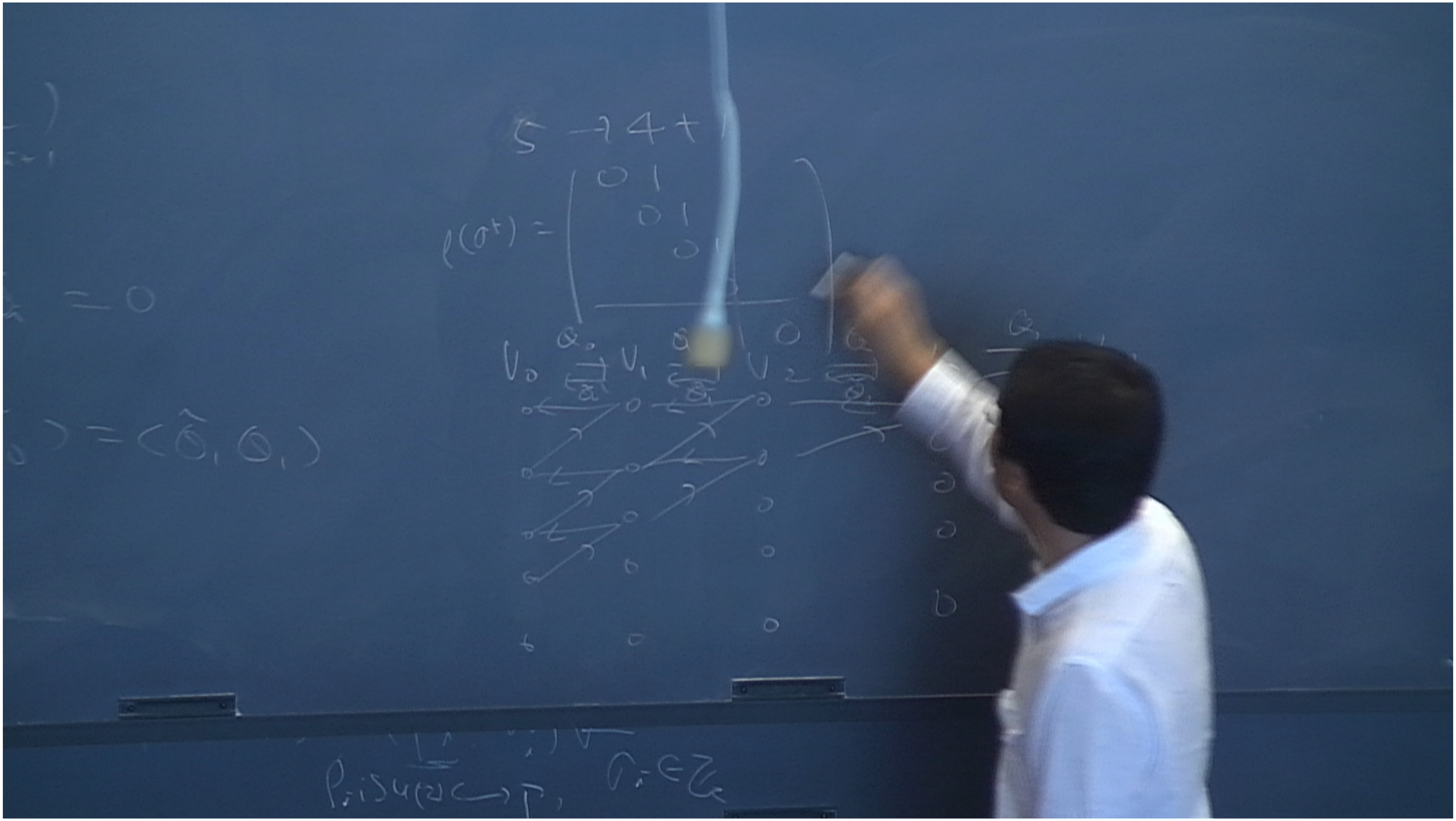
$$N = \sum k\, n_k$$

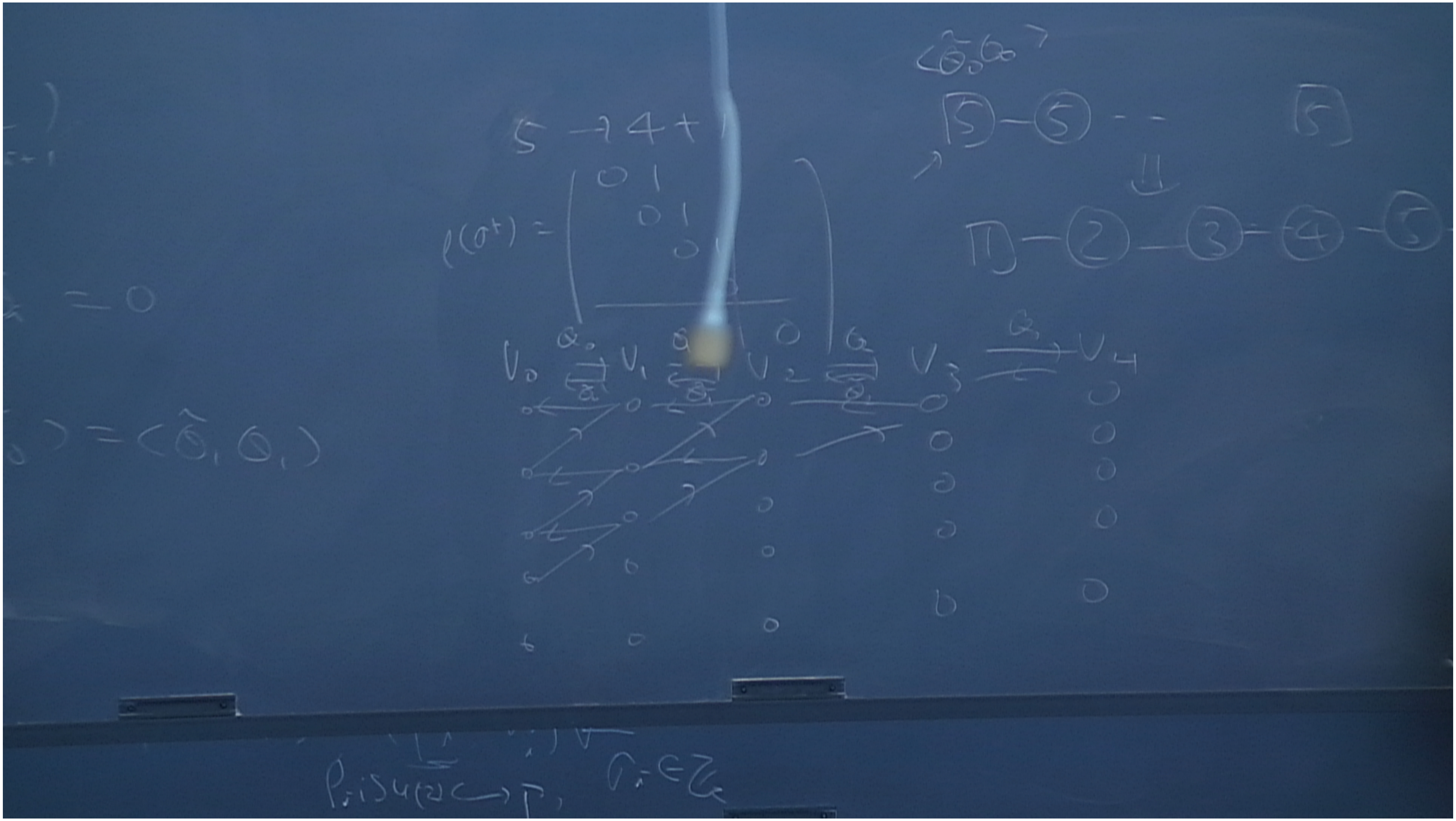
$$\to S\Big[\prod_k U(n_k)\Big]$$

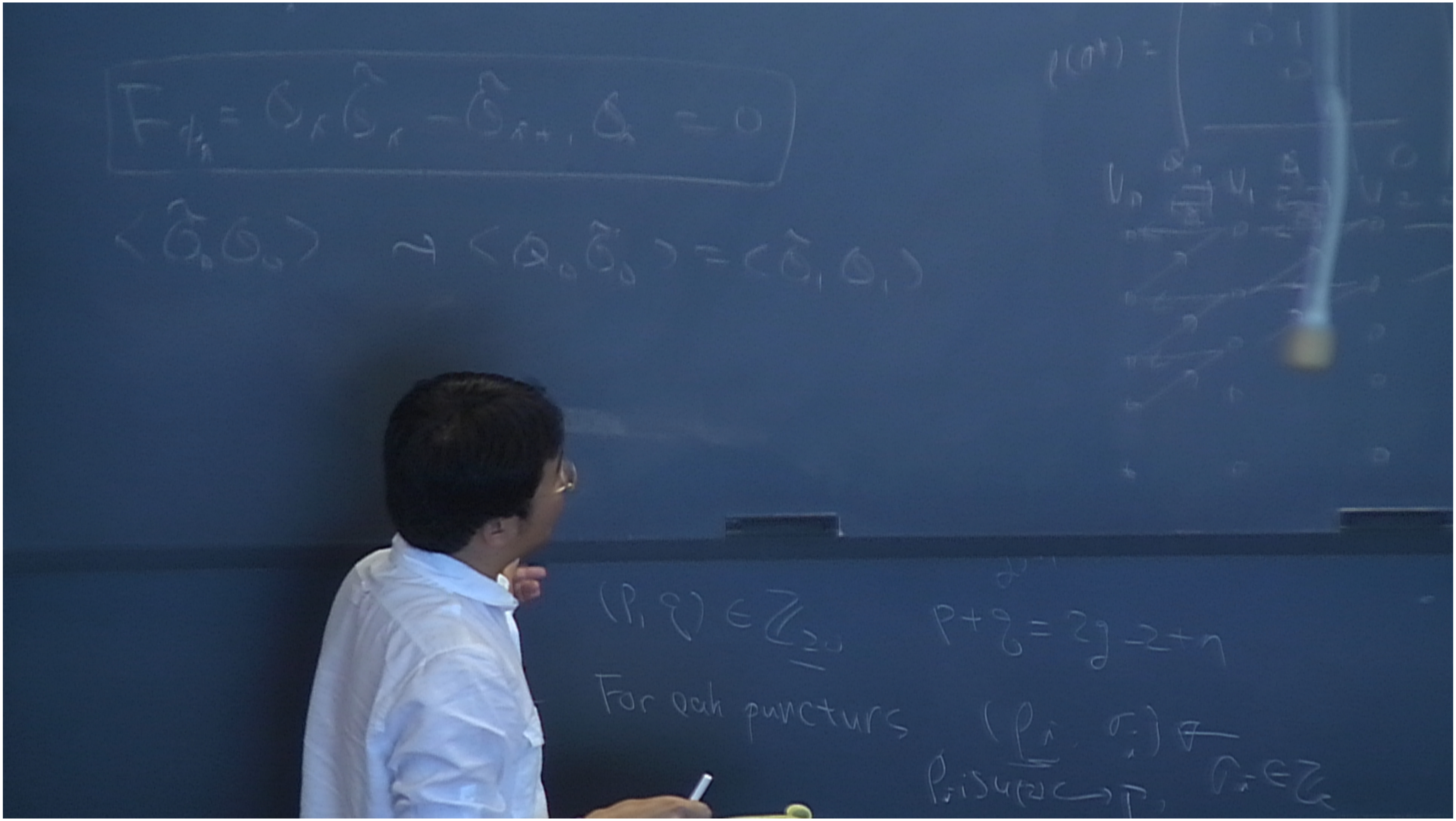

N = Σ k n_k
→ S[Π_k U(n_k)]
6 → 3+2+1

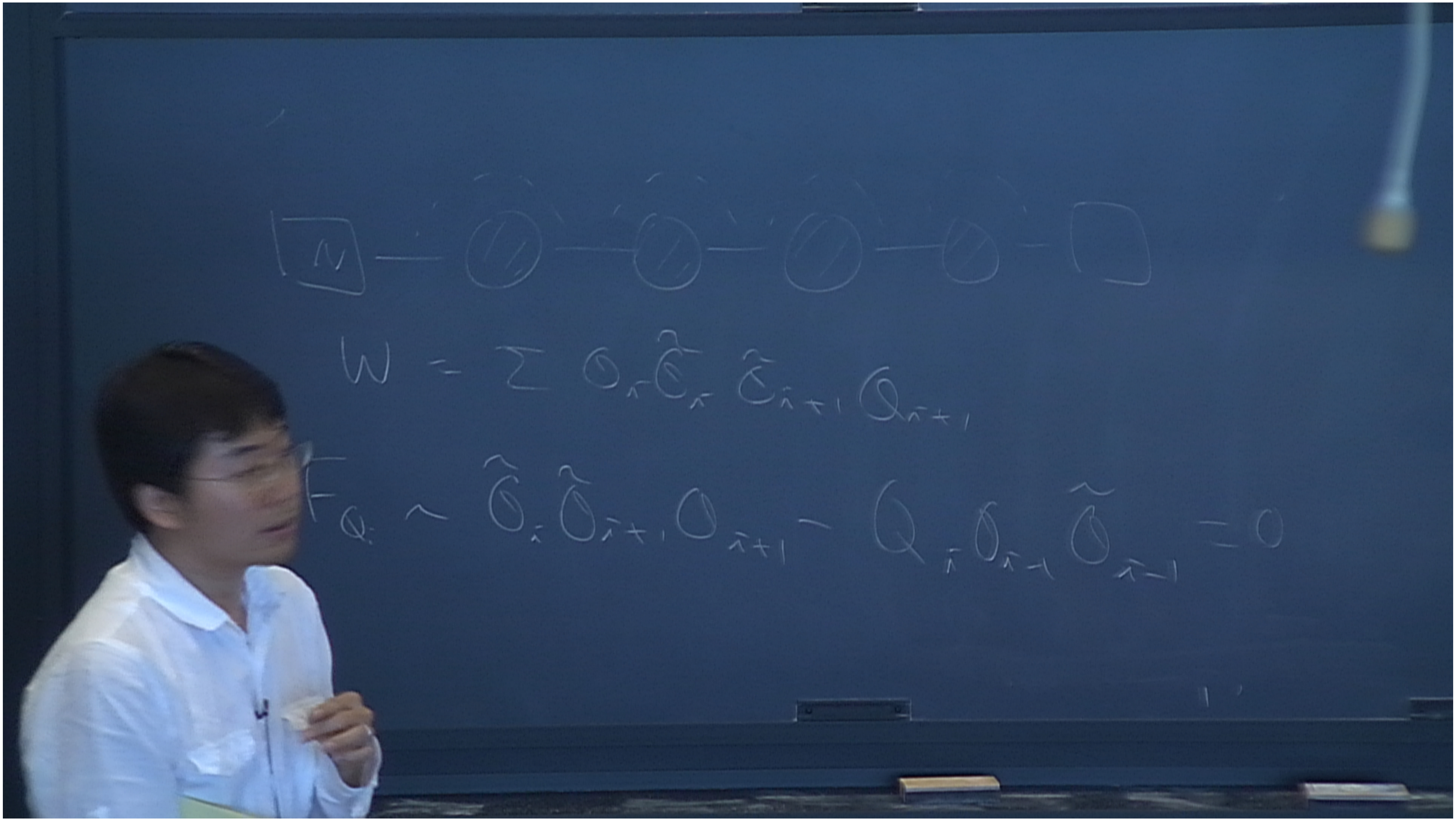

W = Σ_i φ_i (Q_i Q̃_i − Q̃_{i+1} Q_{i+1})
F_{φ_i} = Q_i Q̃_i − Q̃_{i+1} Q_{i+1} = 0
< Q̃_0 Q_0 > → < Q_0 Q̃_0 > = < Q̃_1 Q_1 >
1. N=1
2. Nilpoten
3. "Fan"
4. Fan from
5. N=1
6. Conclusion

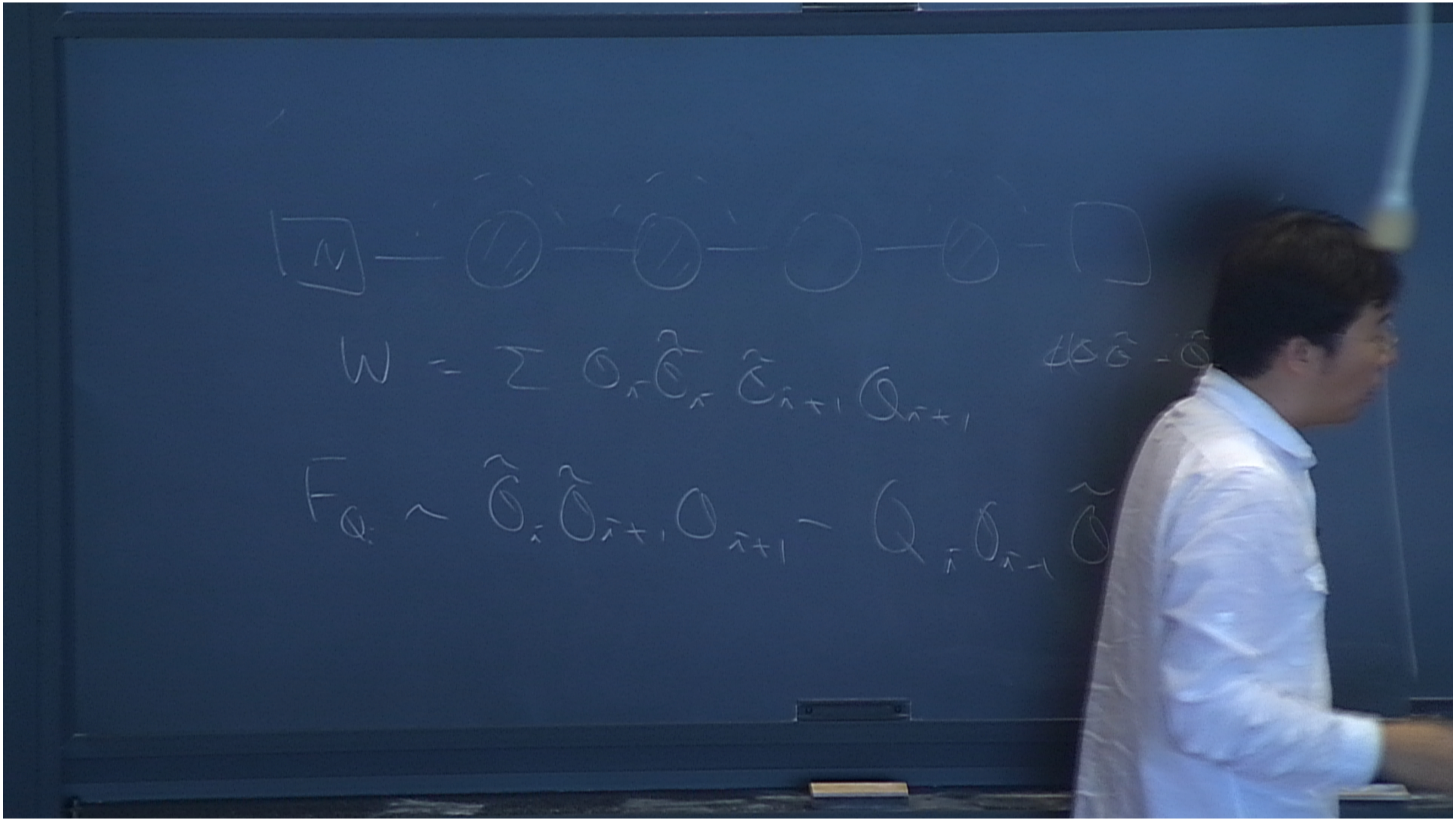


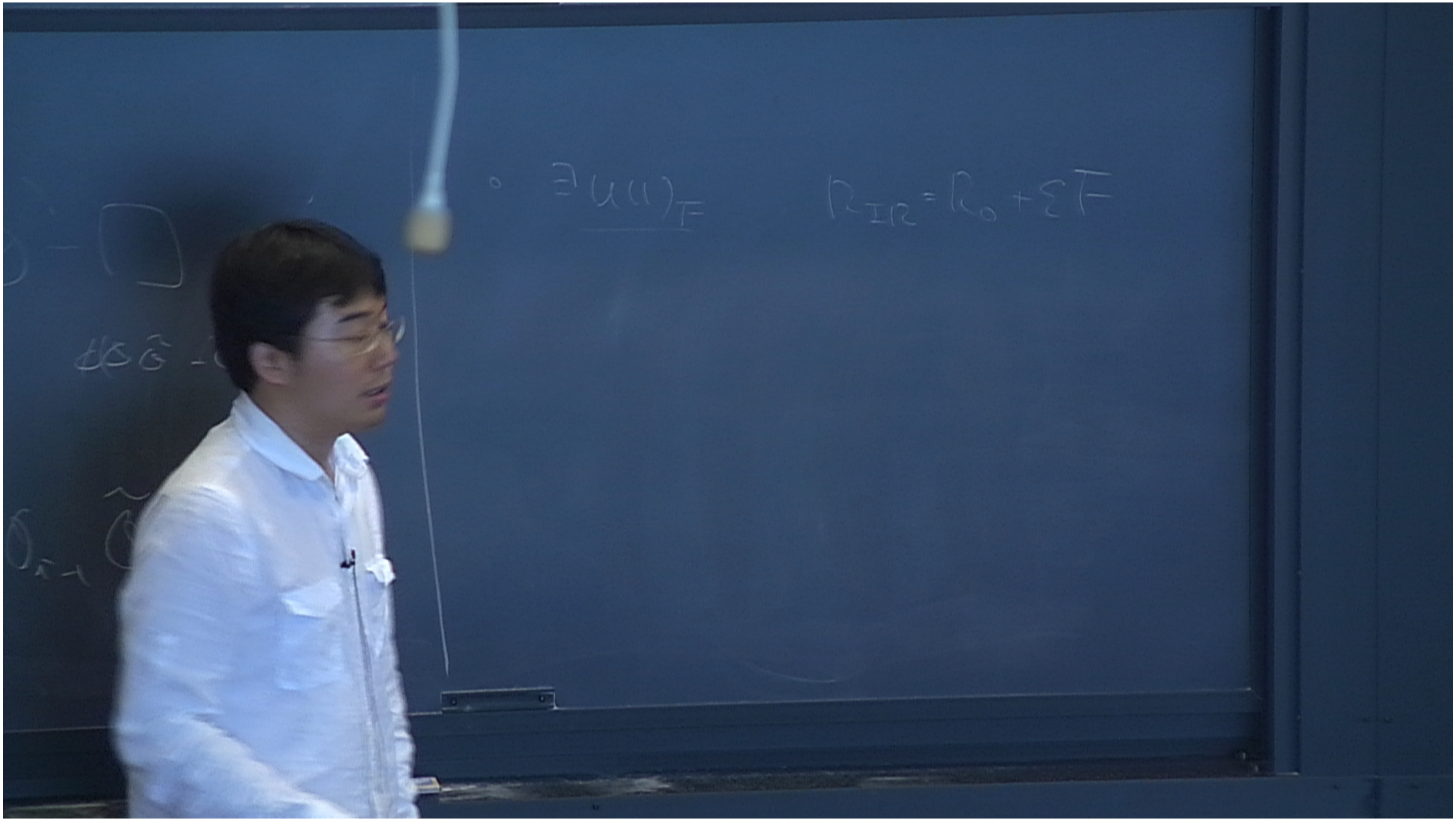

5 → 4 + 1

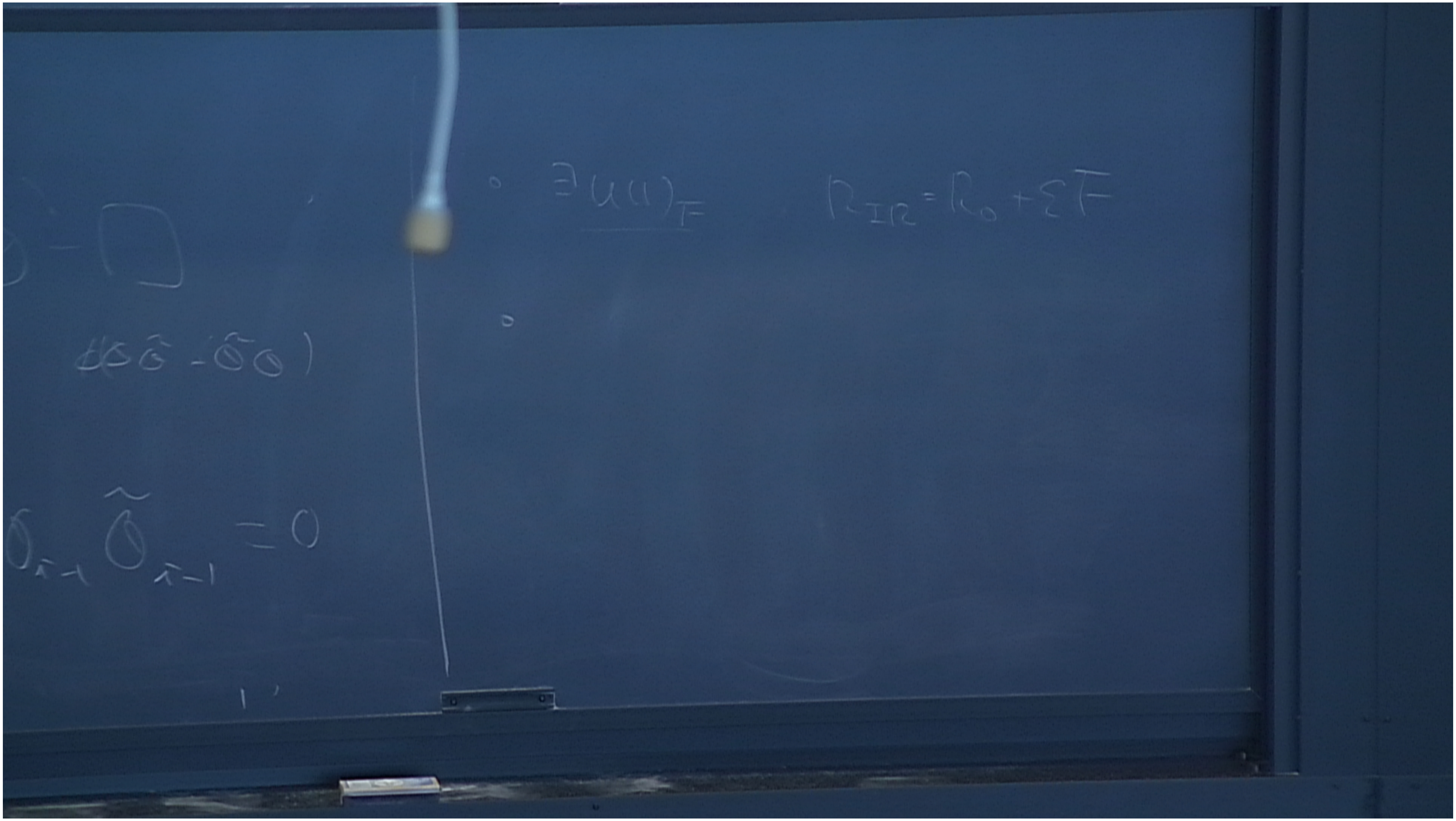





N
W = Σ Q Q̃ Q̃ Q
F ~ Q̃ Q̃ Q − Q Q Q̃ = 0




∃ U(1)_F
R_IR = R_0 + εF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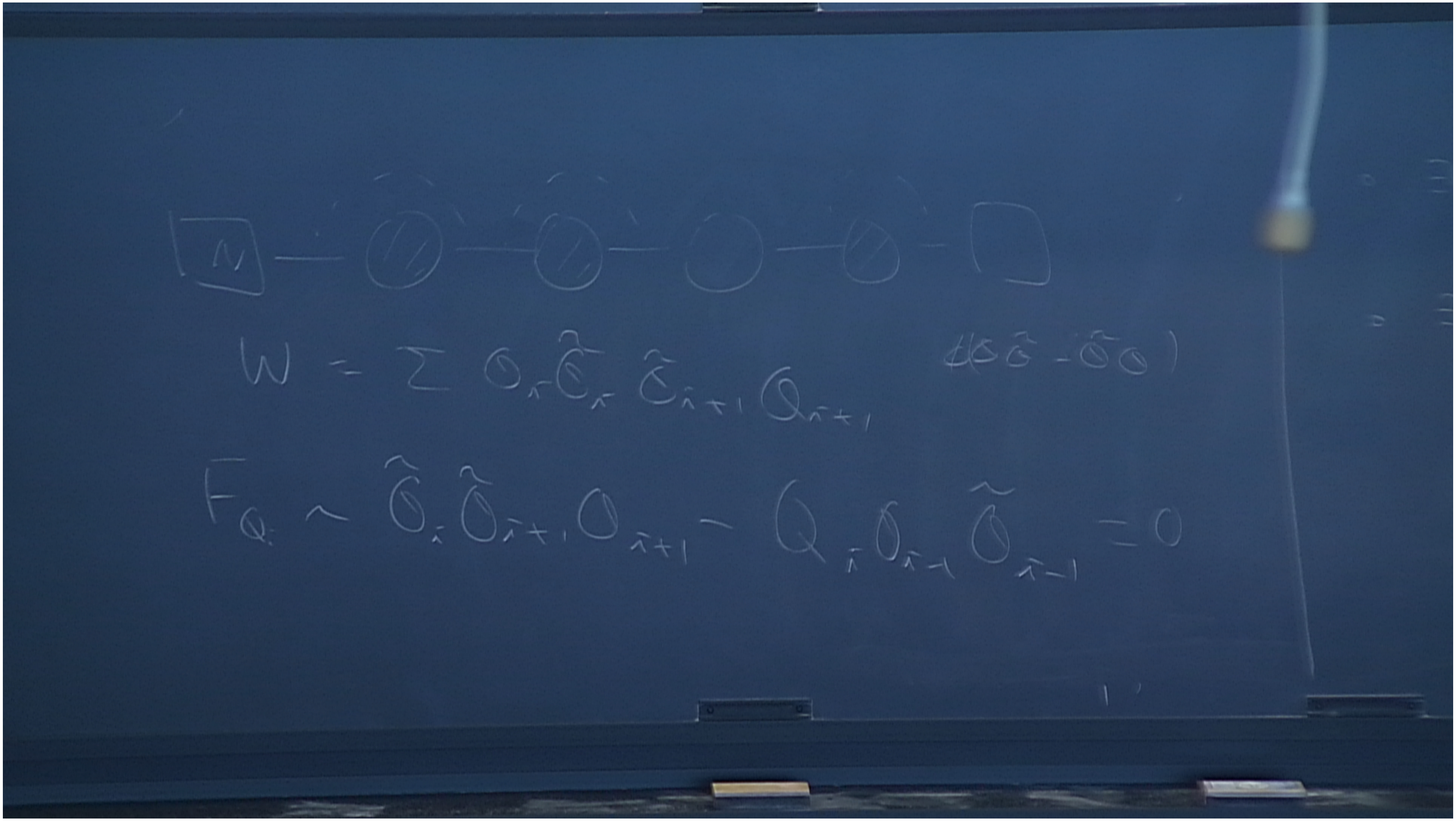
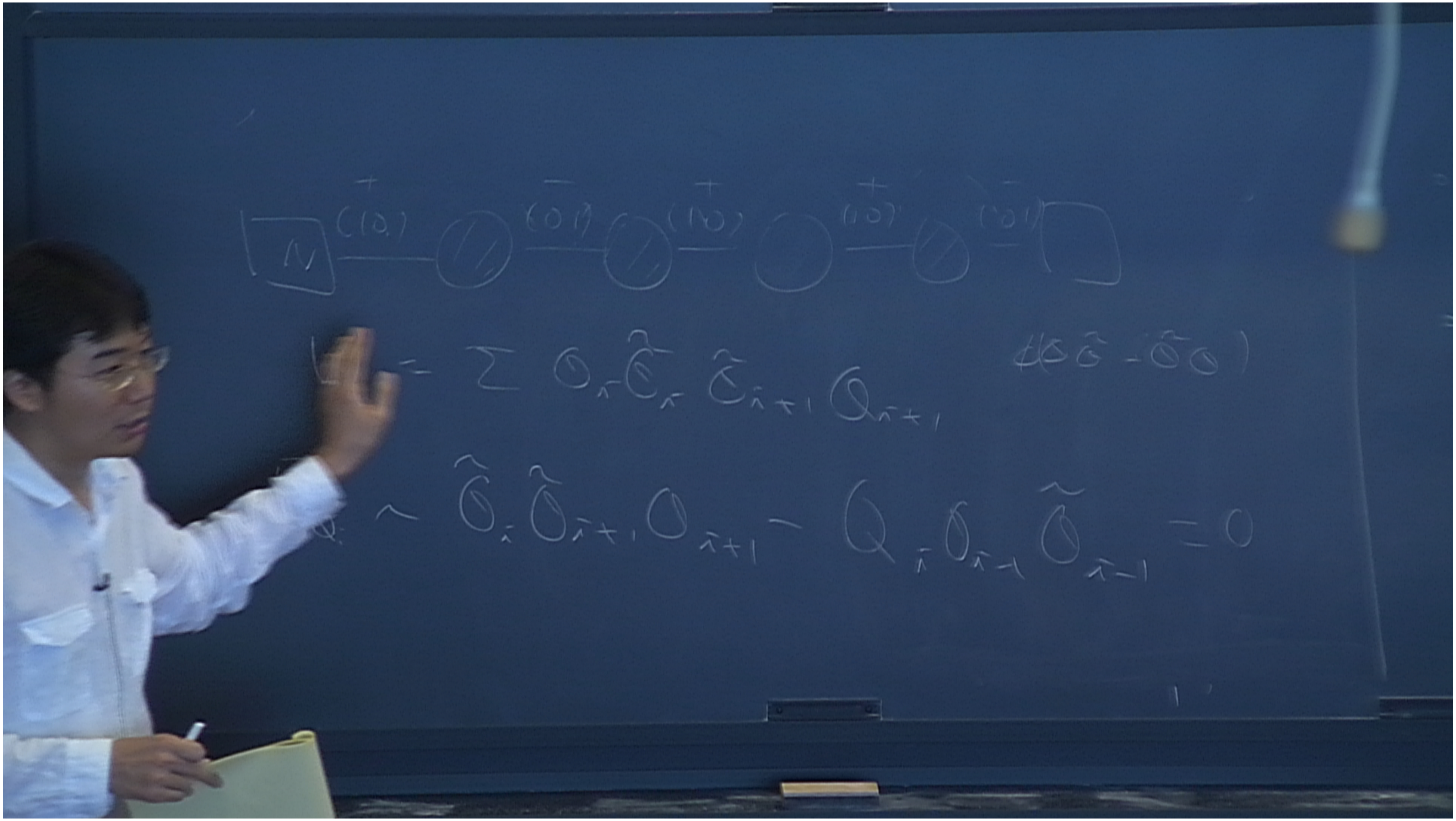
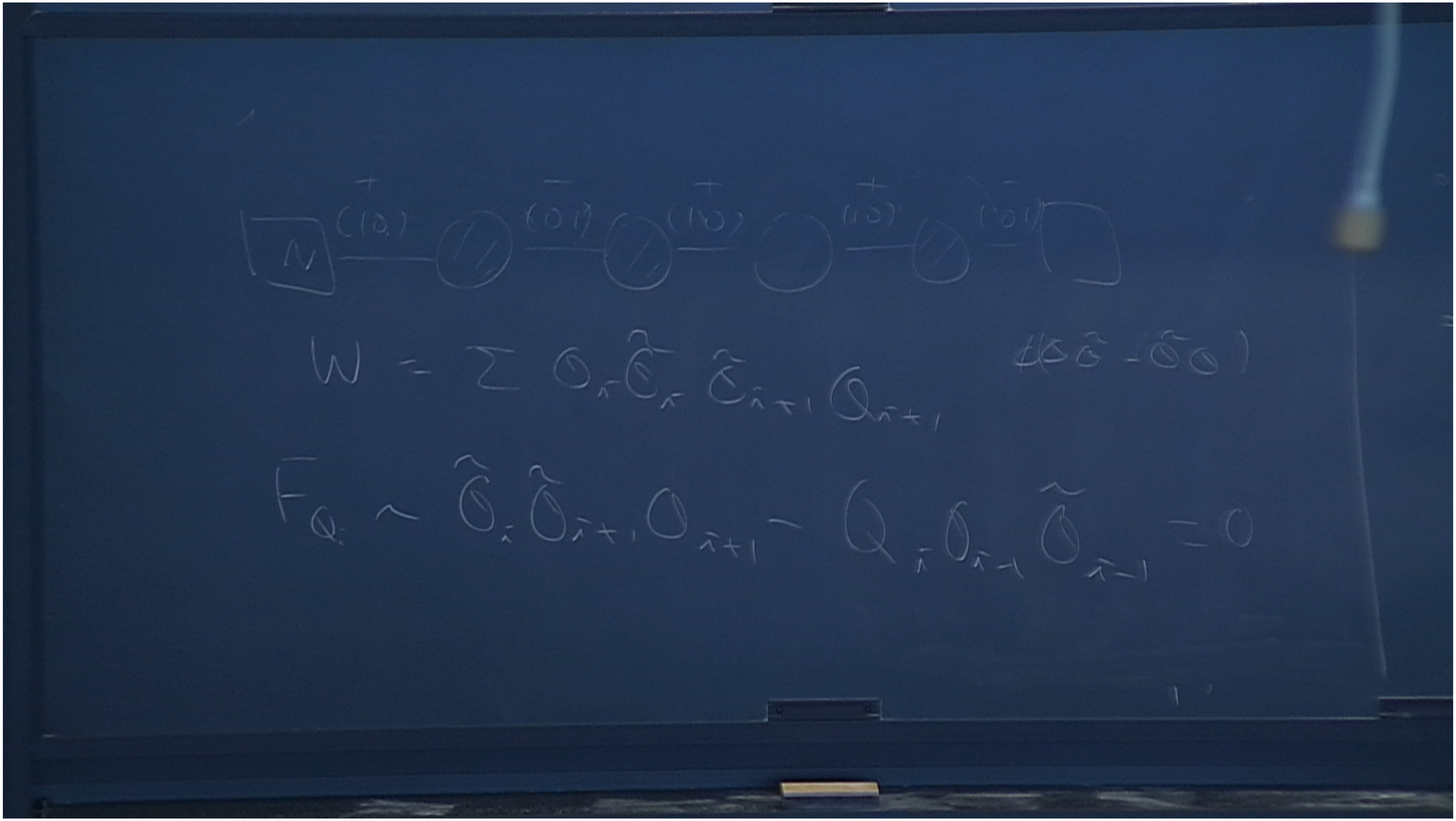
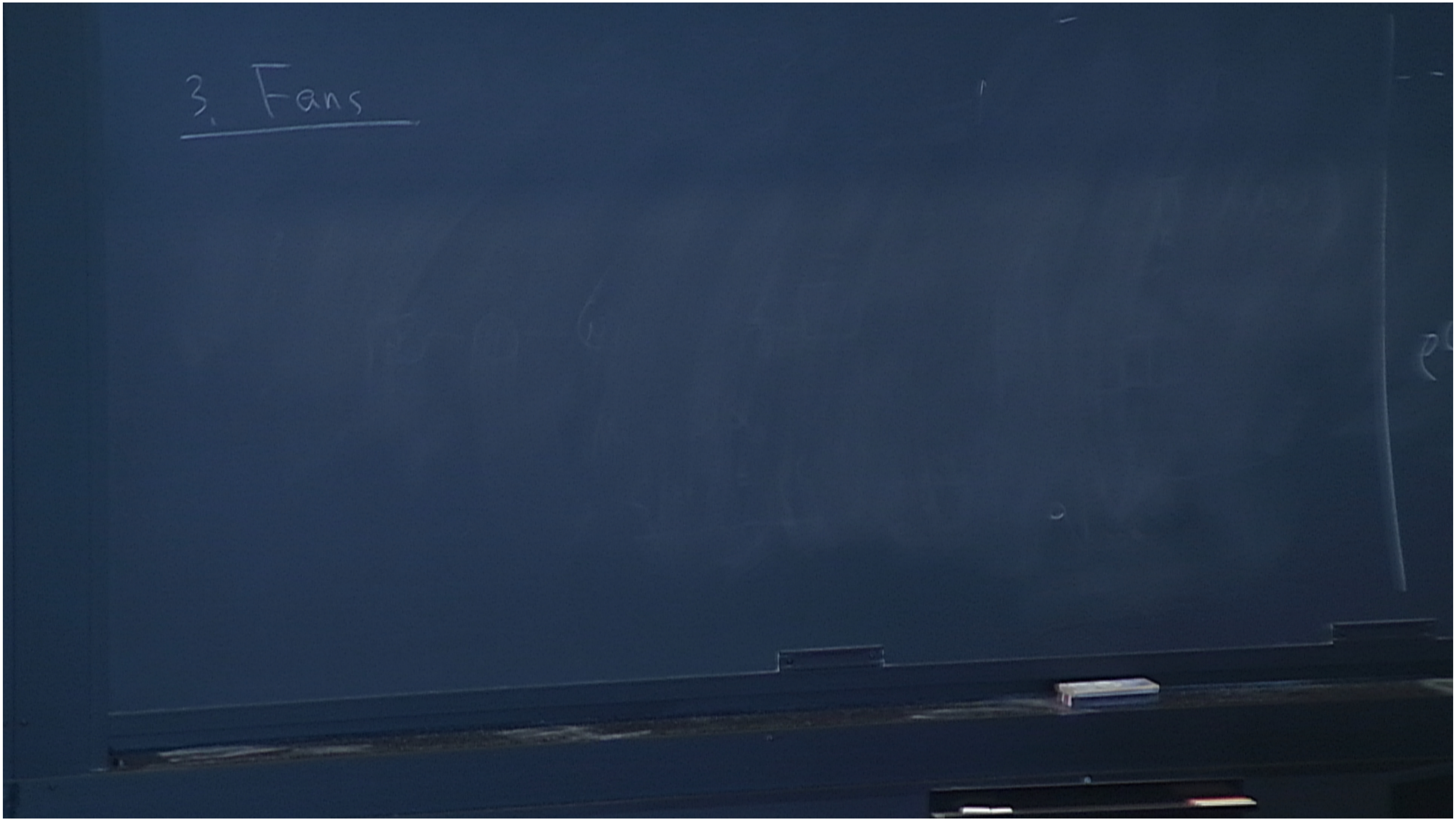
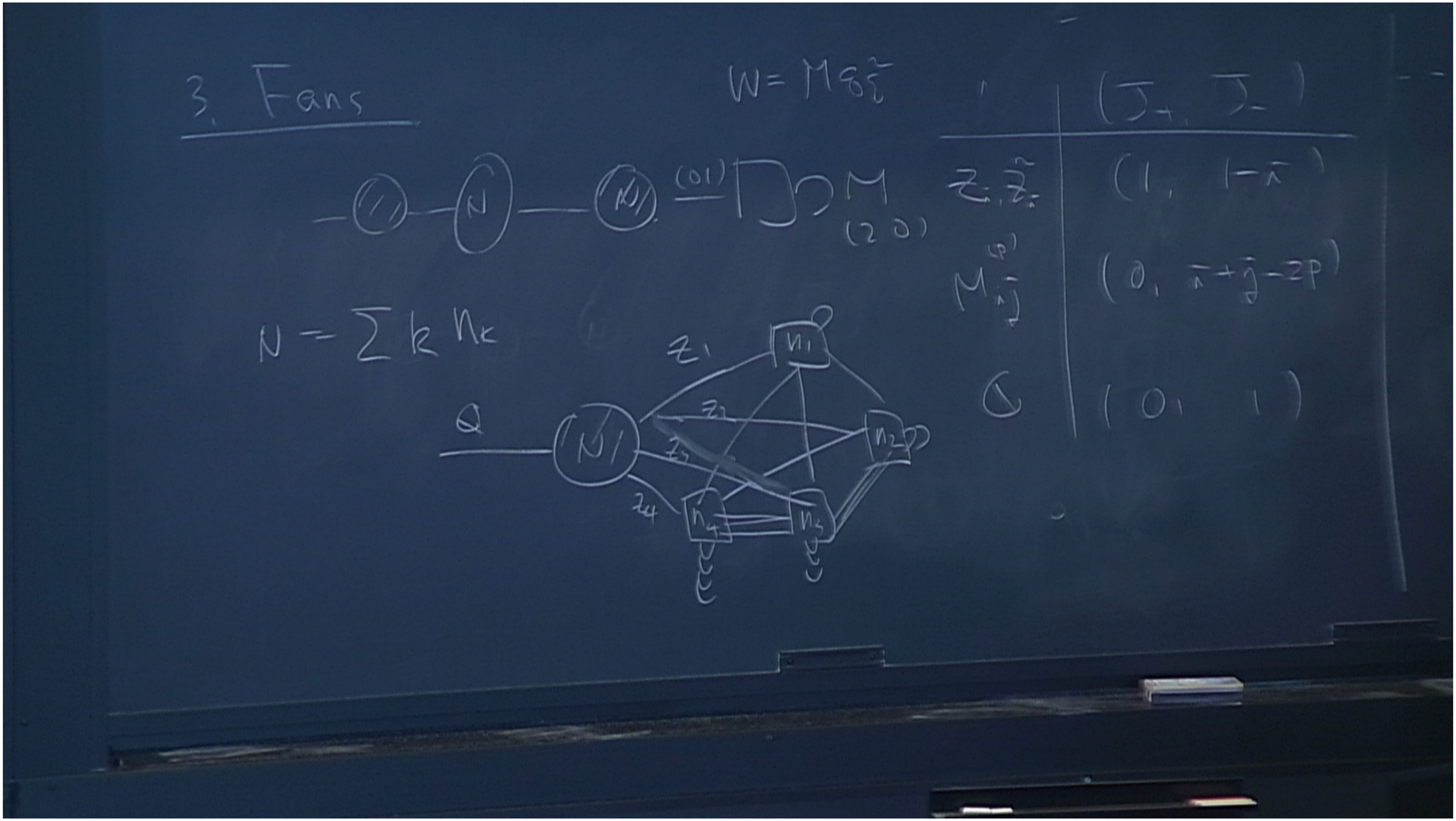
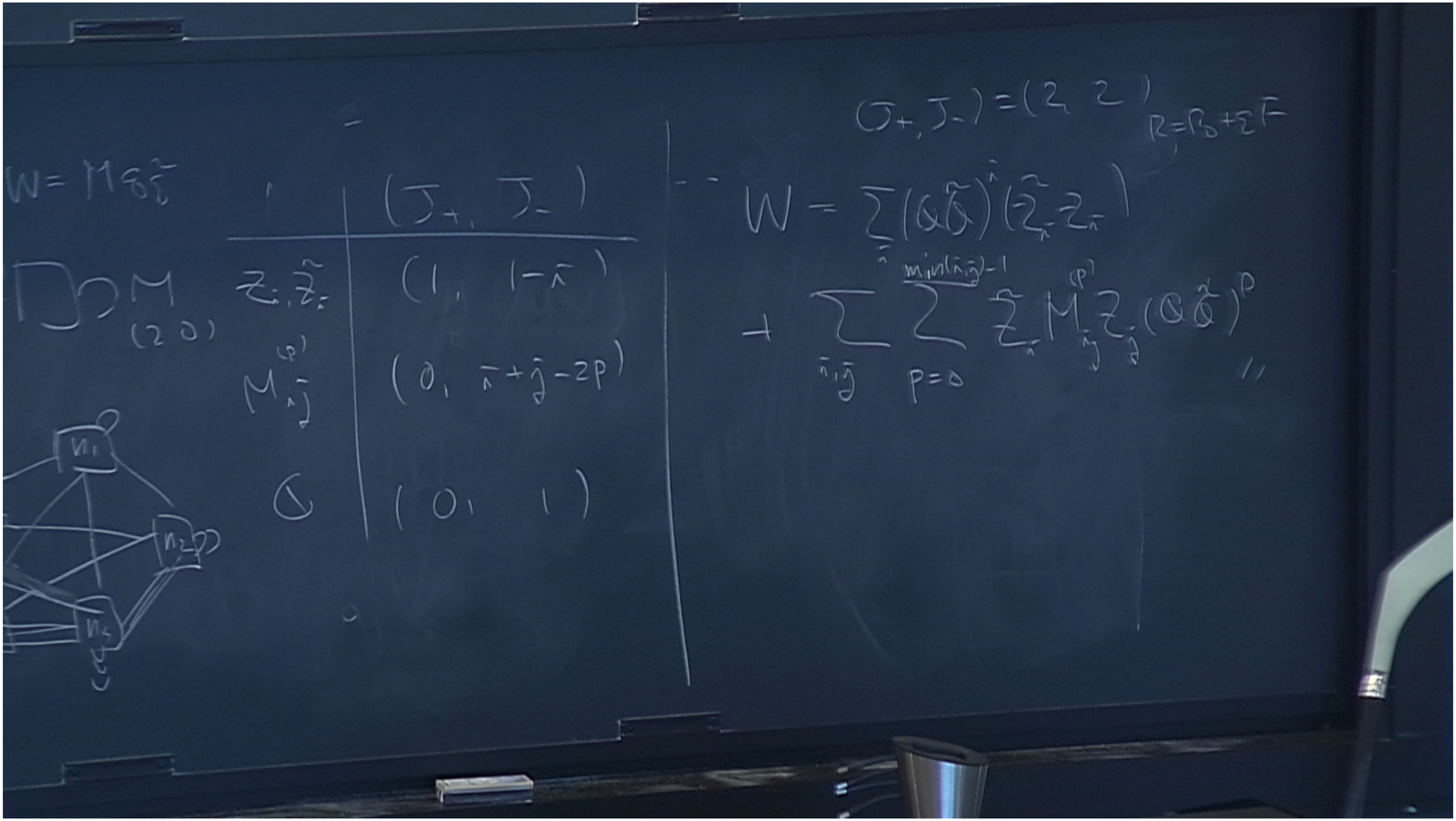

N
W = Σ Q_i Q̃_i Q̃_{i+1} Q_{i+1}
(QQ̃ - Q̃Q)
F_{Q_i} ~ Q̃_i Q̃_{i+1} Q_{i+1} - Q_i Q_{i-1} Q̃_{i-1} = 0

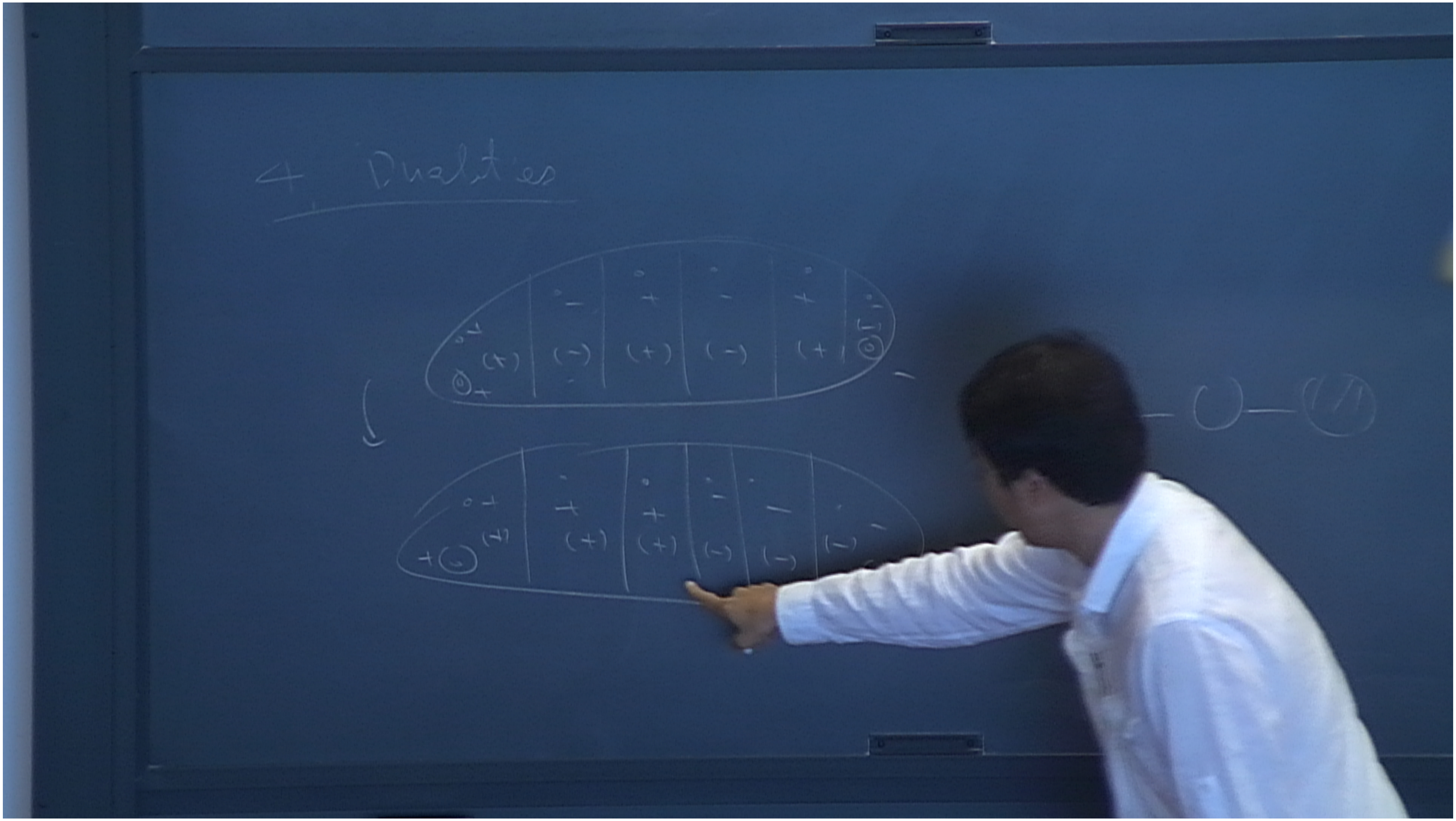


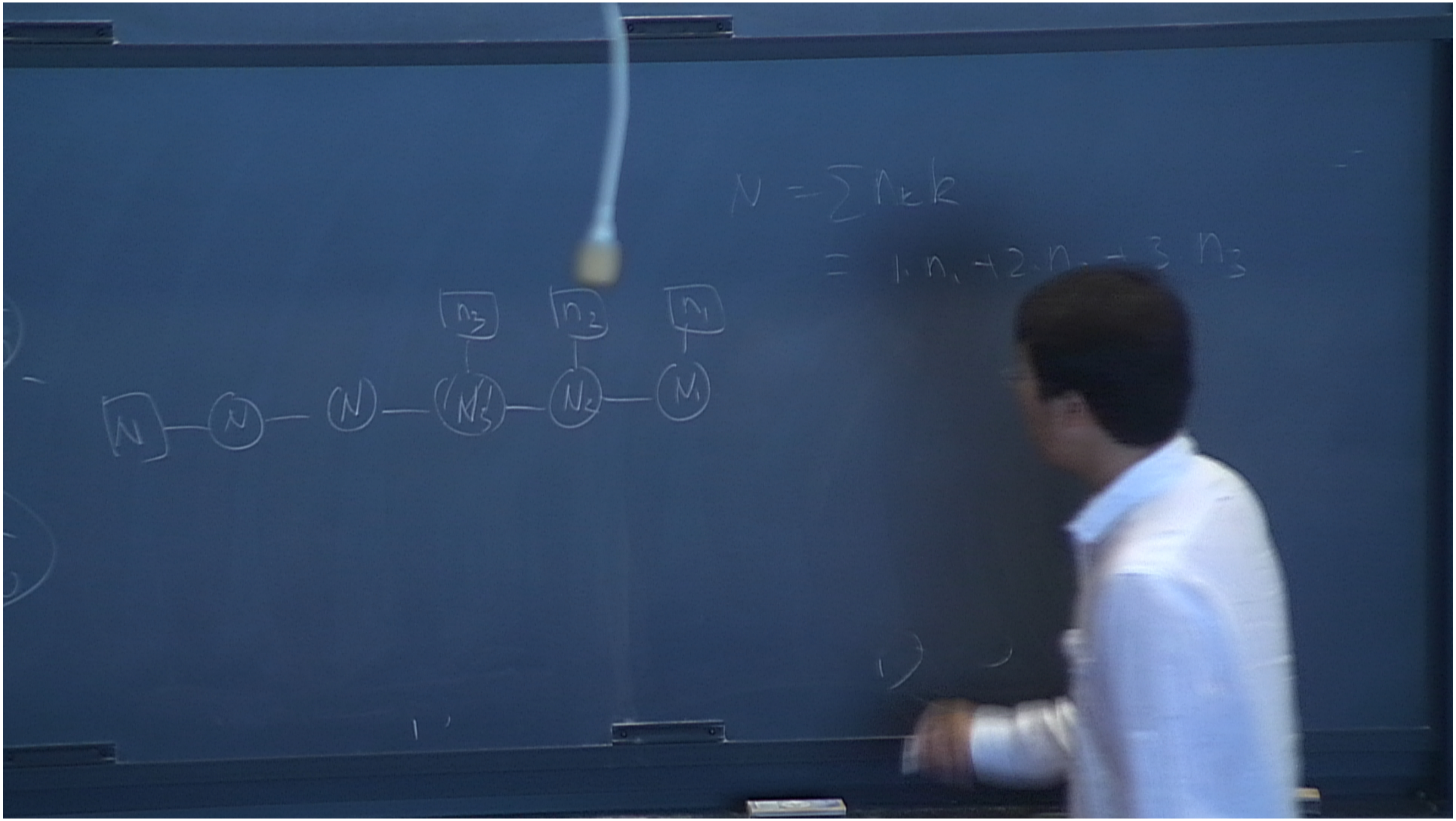

N
(10)
(01)
(10)
(10)
(01)
W = Σ Q_i Q̃_i Q̃_{i+1} Q_{i+1}
F_{Q_i} ~ Q̃_i Q̃_{i+1} Q_{i+1} − Q_i Q_{i−1} Q̃_{i−1} = 0

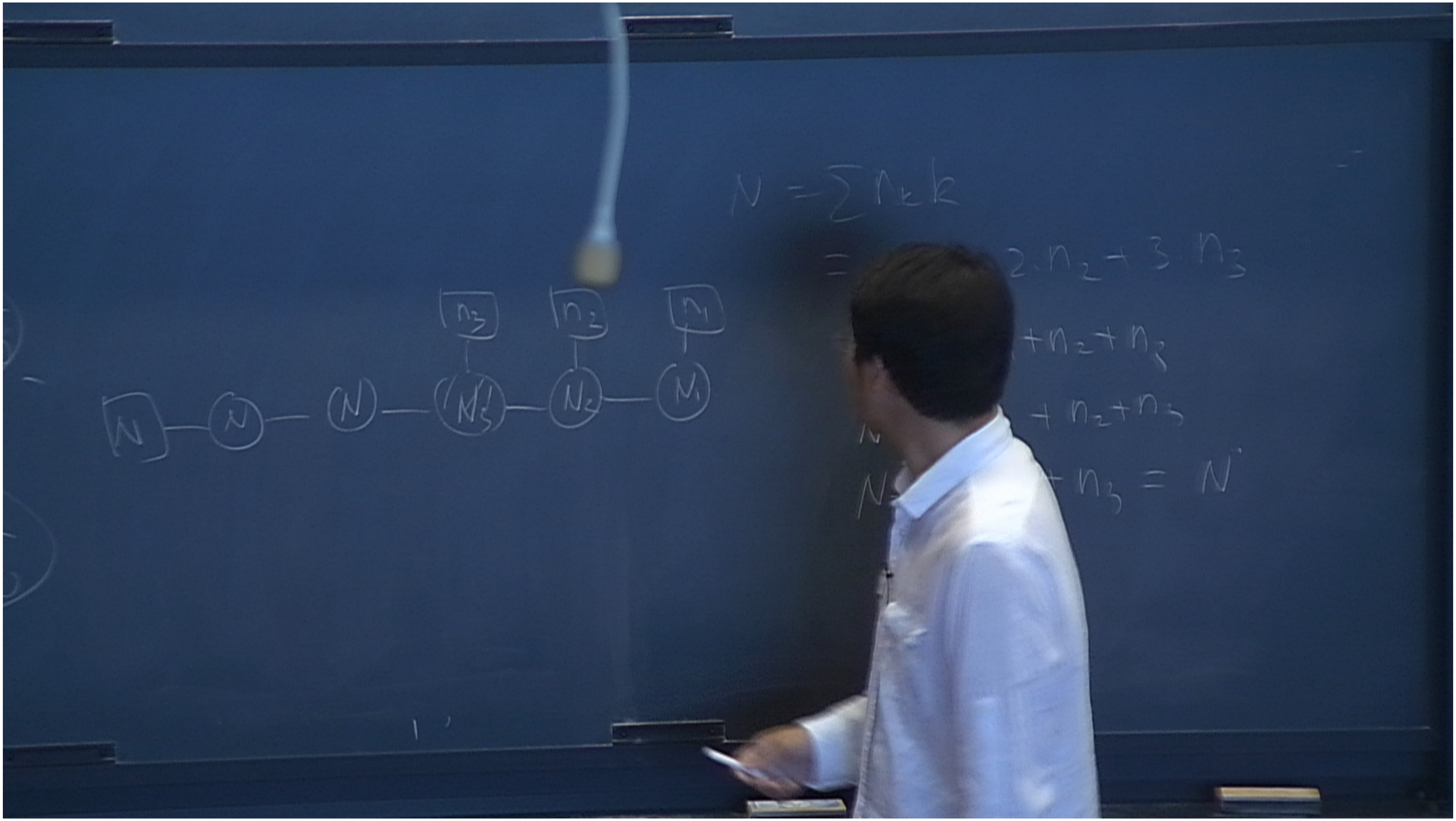

3. Fans

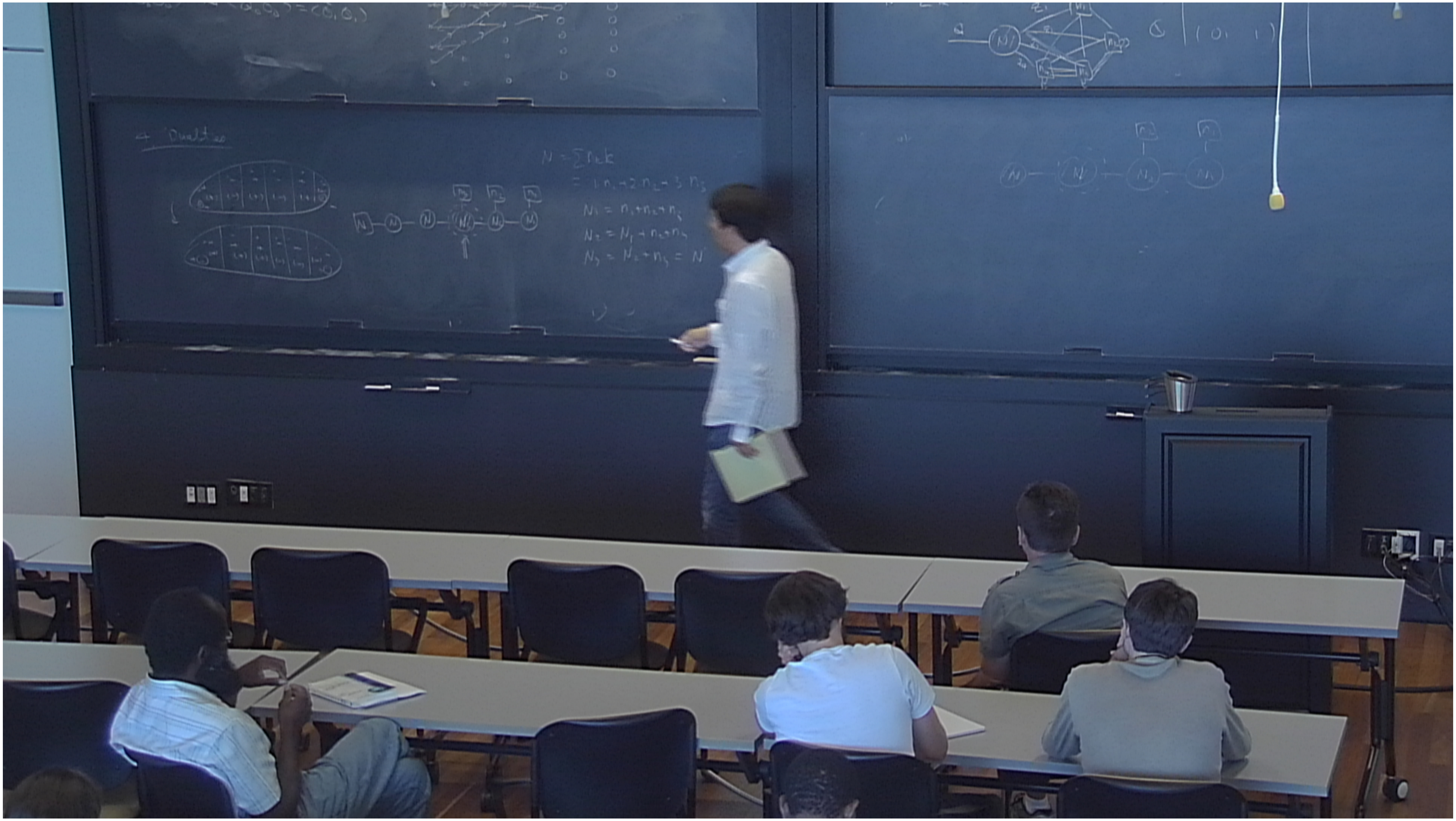

3. Fans
N = ∑ k n_k
Q
(0, 1)

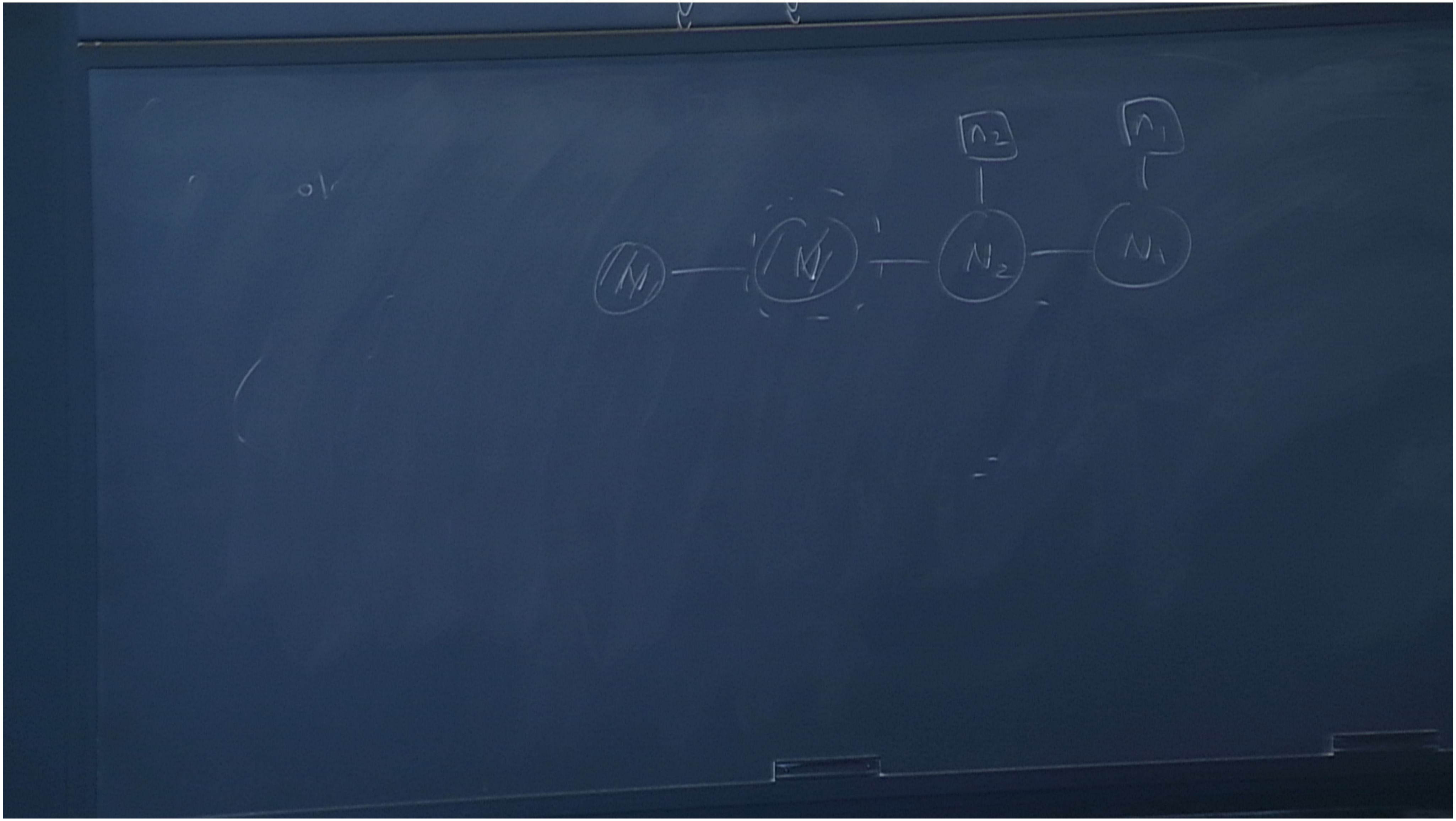

(J+, J-)
(0, 1)
p=0

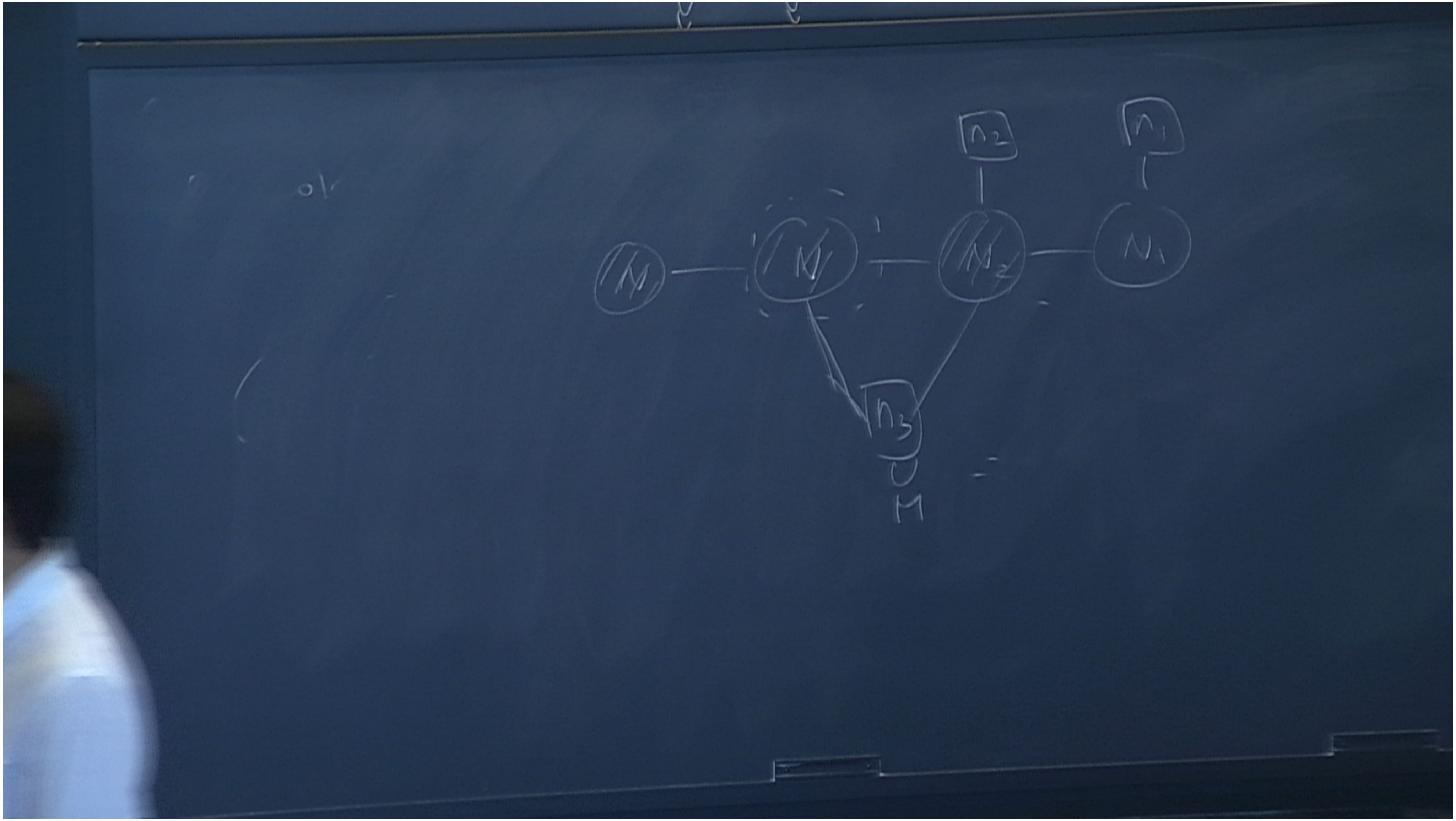

4. Dualities


N = ∑ n_k k
= 1·n₁ + 2·n₂ + 3·n₃
n₃
n₂
n₁
N
N
N
N₃
N₂
N₁

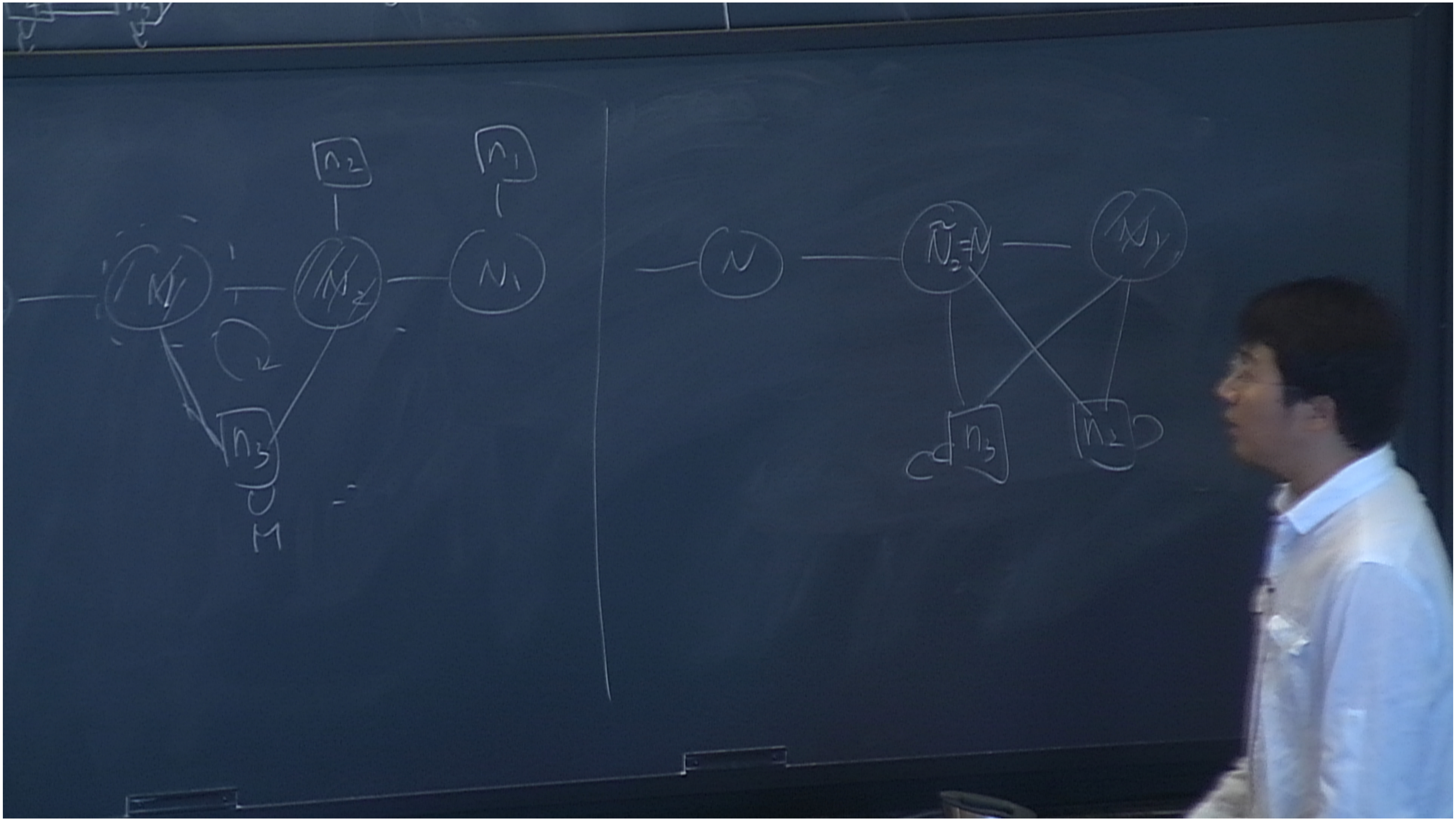

N = ∑ n_k k
n3
n2
n1
N
N
N
N2
N1



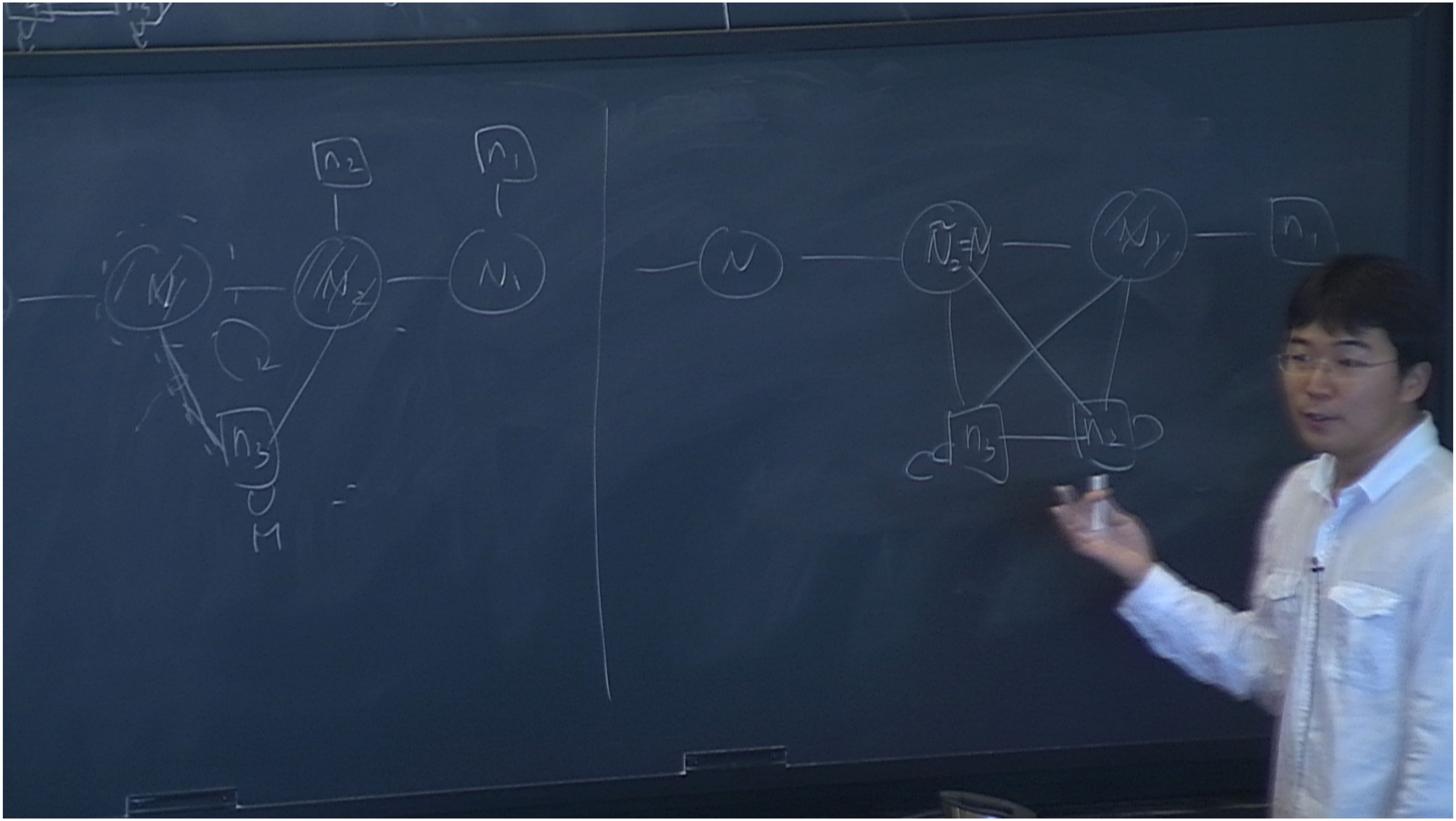

n2
n1
N2
N1

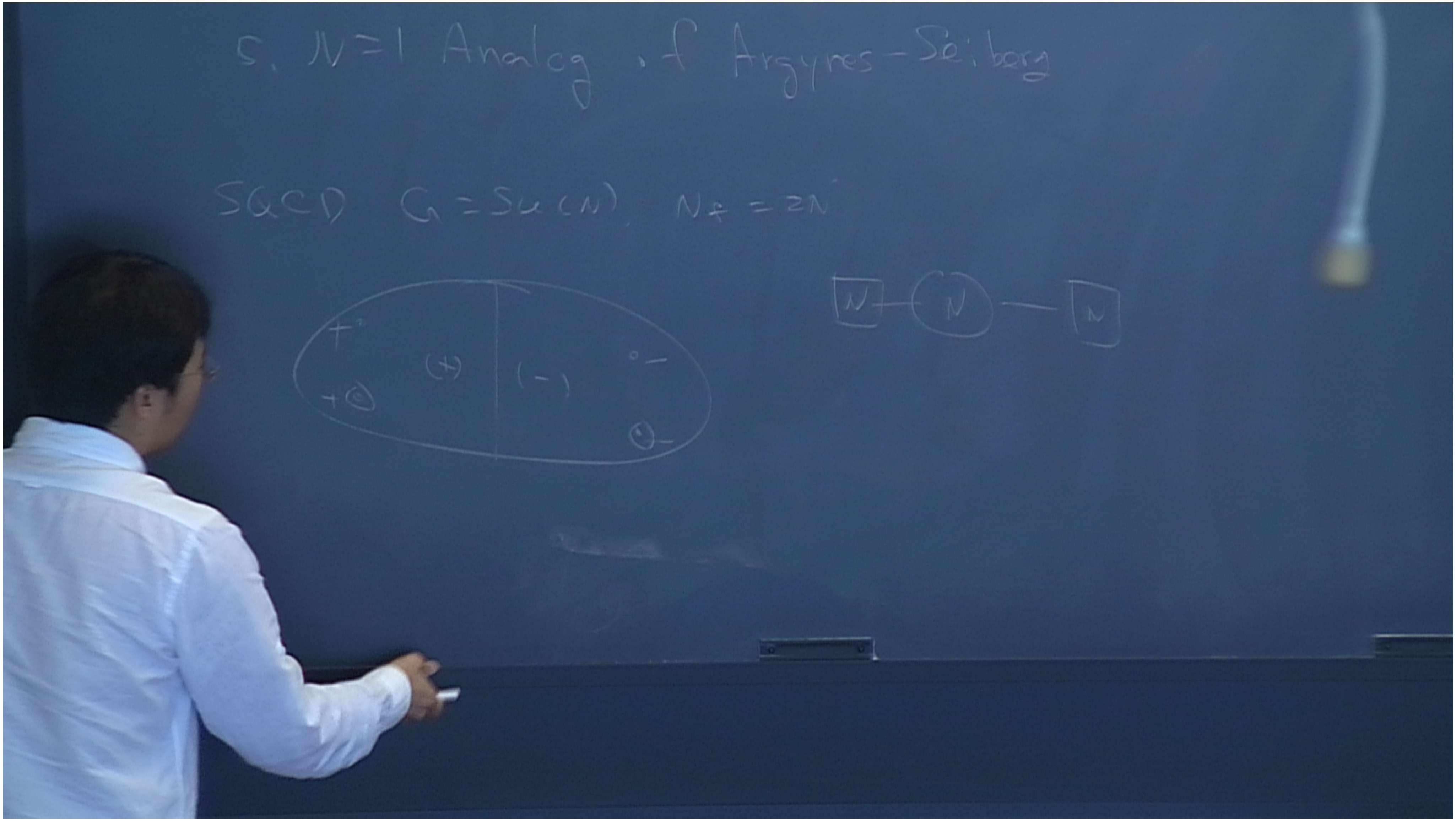


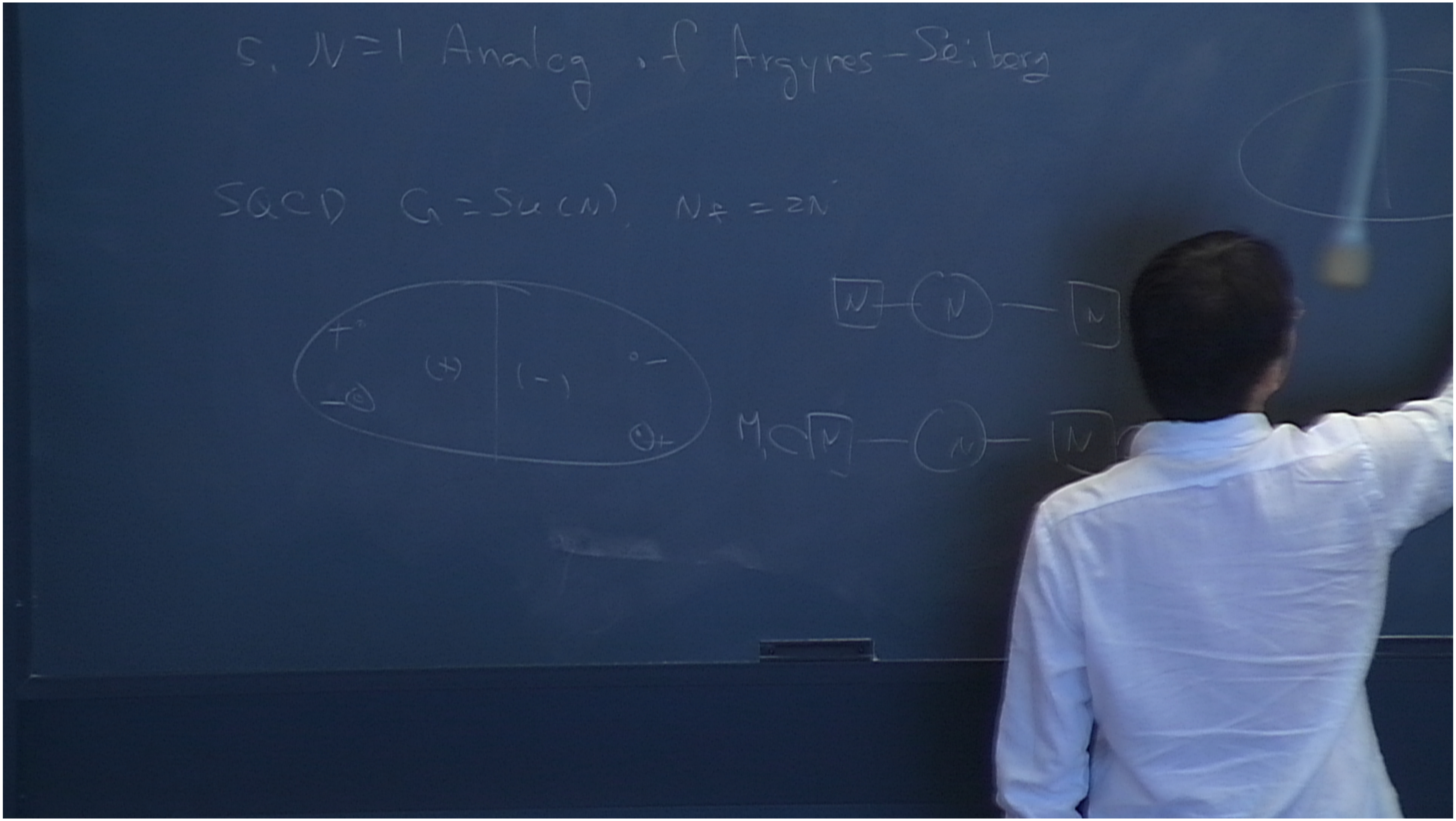
n2
n1
M
M
M2
N1
n3
M



n2
n1
N1
n3
M
N
n3
n2




5. N=1 Analog of Argyres-Seiberg
SQCD G = SU(N), Nf = 2N
(+)
(−)
N
N
N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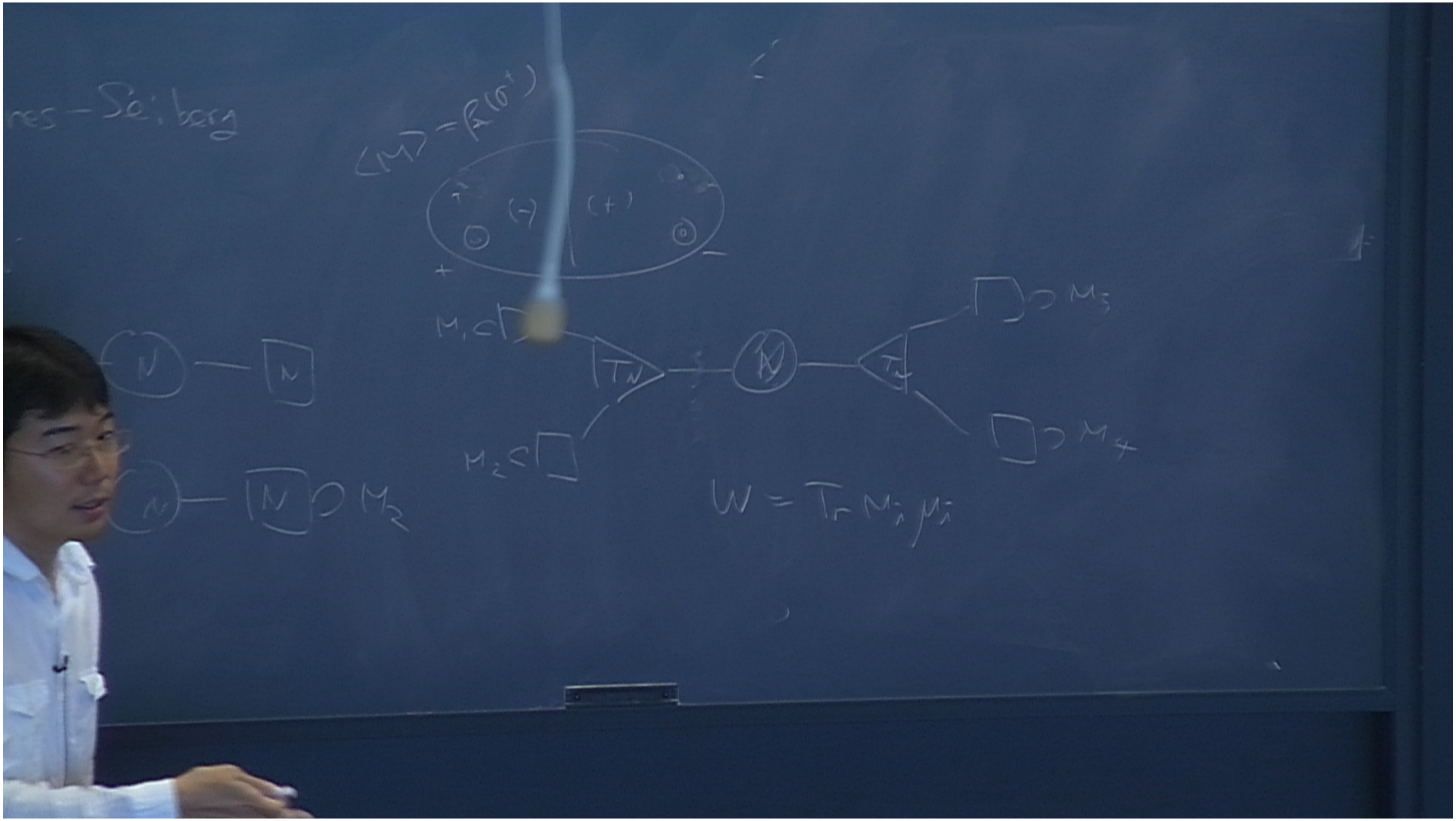
nes – Seiberg
W = Tr M_i μ_i