

Title: Perturbative Classical Field Theory

Date: Nov 28, 2011 03:30 PM

URL: <http://pirsa.org/11110082>

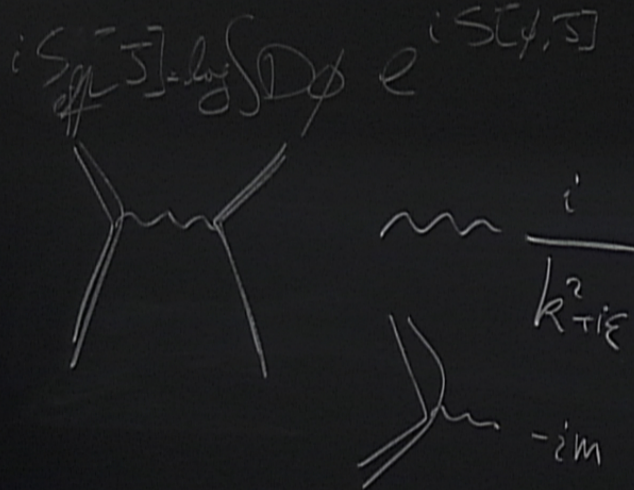
Abstract:

<p>What is the classical limit of perturbative quantum field theory?</p>

<p>What have we learned about it since the advent of the EFT approach to GR?</p>



More applications • Summary



More applications • Summary

$$i \int_{\text{eff}} \vec{S} \cdot d\vec{\phi} e^{i S[\phi, \vec{A}]} \quad \int_{\text{GF}} \frac{1}{2\epsilon_0} (\partial_\mu A^\mu)^2 d^4x$$



$$\text{wavy line} \quad \frac{i}{k^2 - i\epsilon}$$

$$\text{crossed lines} \quad -im$$

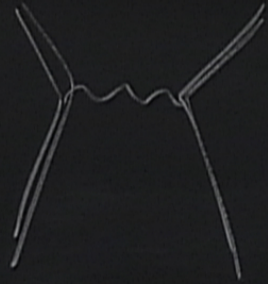
Perturbative Classical FT

- Missing Link to QFT
- Breakthrough
- Classical FT
- post-Newtonian
- More applications
- Summary

$$iS_{\text{eff}}[\phi] = \log \int \mathcal{D}\phi e^{iS[\phi, \psi]} \quad S = \int \frac{1}{2\epsilon} (\partial_\mu A^\mu)^2 d^4x$$

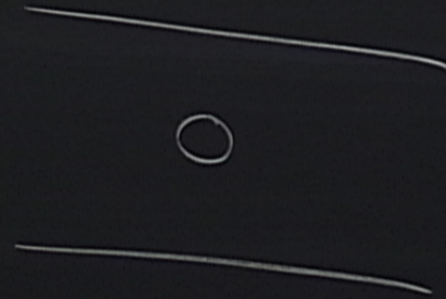
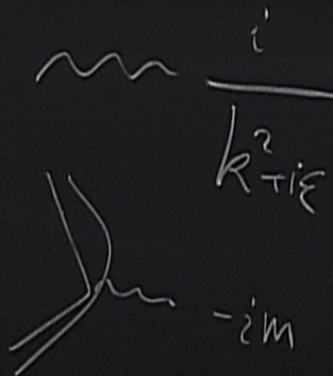
More applications • Summary

$$i[S[\phi, A]] = \log \int \mathcal{D}\phi$$



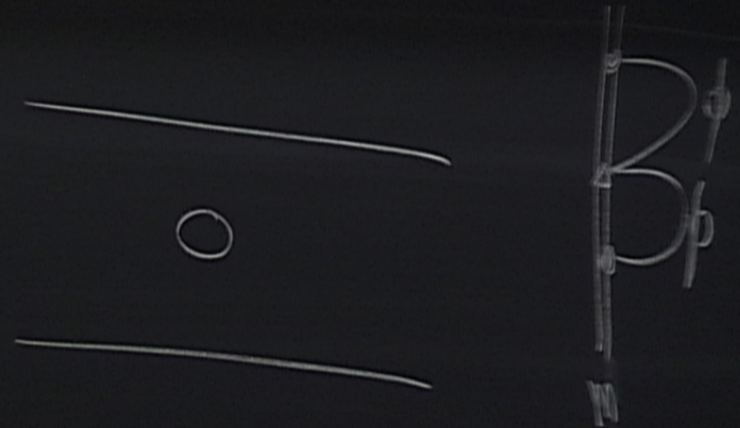
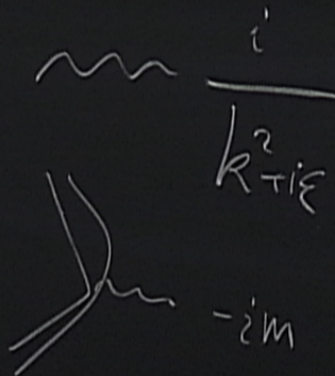
$$e^{iS[\phi, A]}$$

$$S_{GF} = \int \frac{1}{23} (\partial_\mu A^\mu)^2 d^4x$$



More applications • Summary

$$iS_{eff}[\phi] = \log \int \mathcal{D}\phi e^{iS[\phi, A]} \quad S_{GF} = \int \frac{1}{23} (\partial_\mu A^\mu)^2 d^4x$$



$$v_0 \ll L$$

1) PN

$$\frac{v_0}{R} \sim v^2 \ll 1$$

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$$\frac{r_0}{R} \sim v^2 \ll 1$$

2) Extreme M.R.

$$\frac{m}{M} \ll 1$$

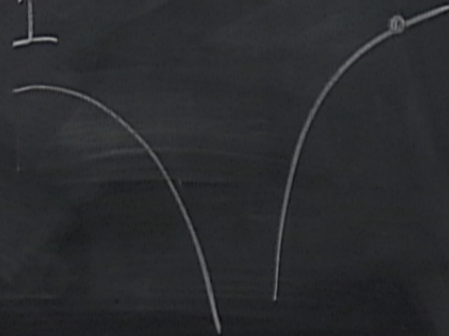
$$v_0 \ll L$$

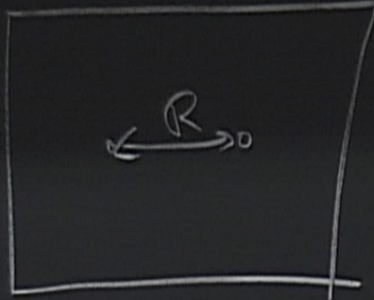
1) PN

$$\frac{r_0}{R} \sim v^2 \ll 1$$

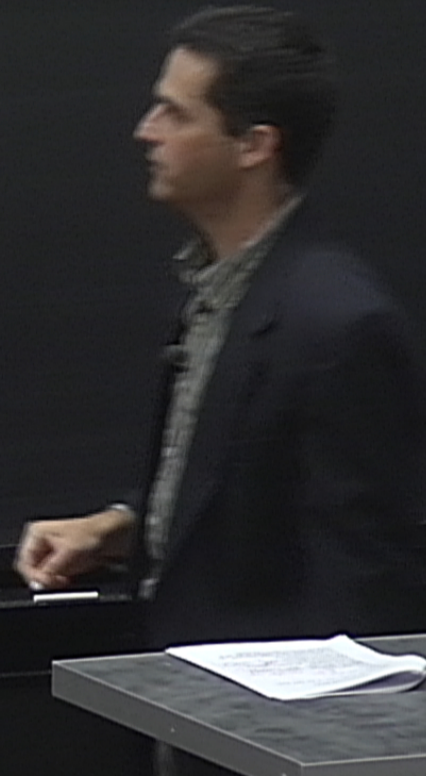
2) Extreme M.R.

$$\frac{r_0/2}{R_0/2} \sim \frac{m}{M} \ll 1$$





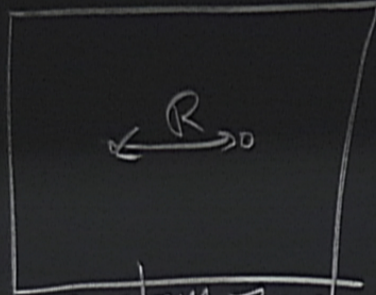
BH Zone



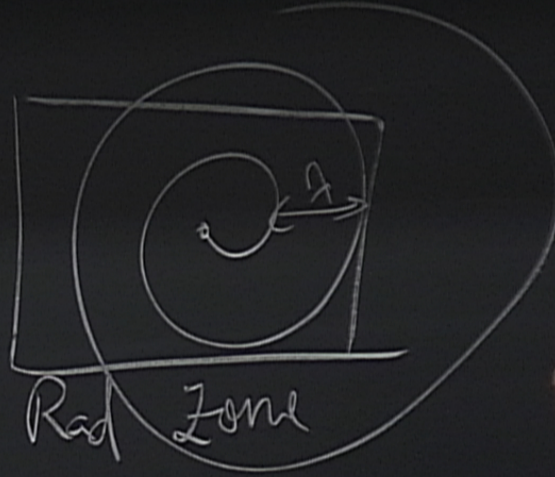


BH Zone

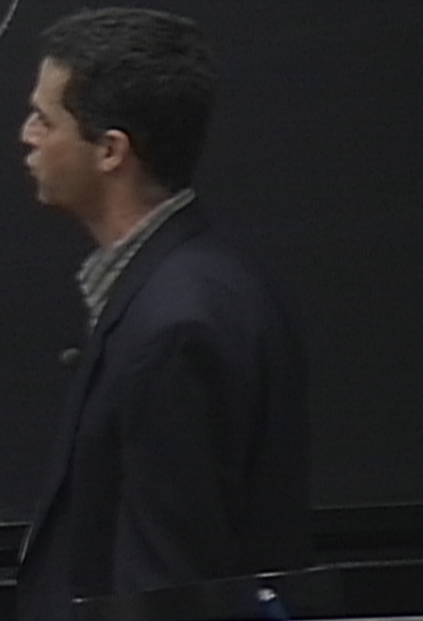
$r_0 \ll R$

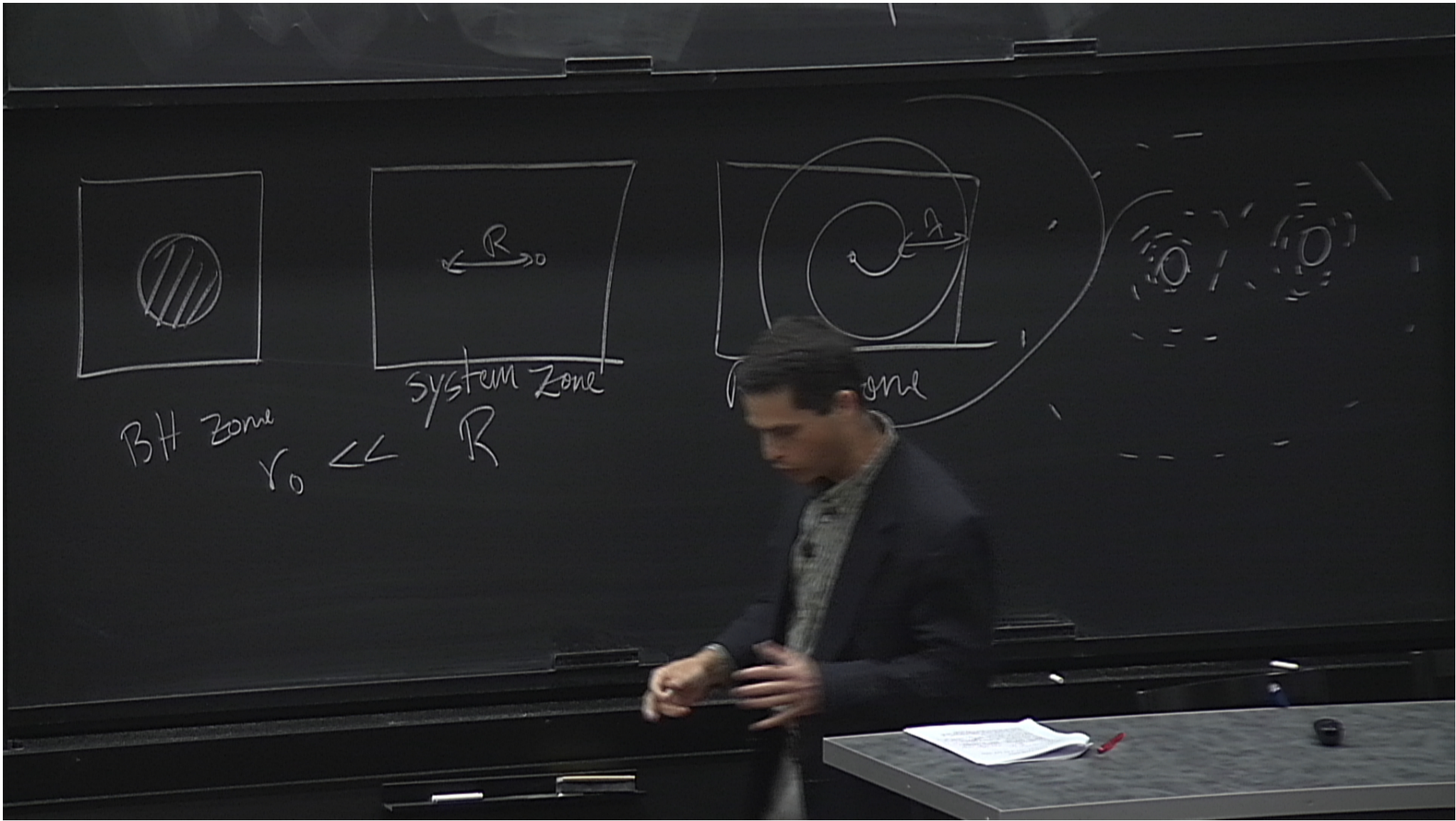


System Zone



Rad Zone

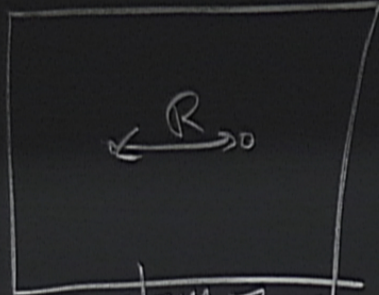






BH zone

$r_0 \ll$

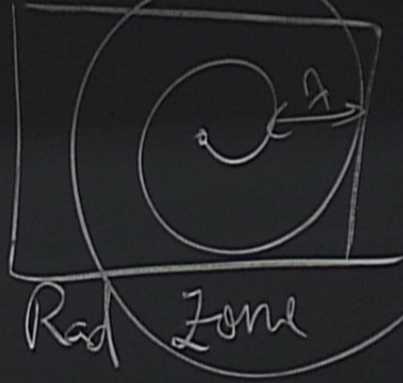


system zone

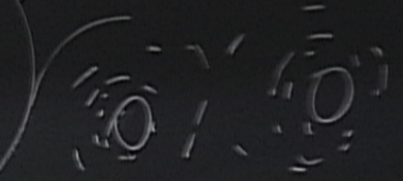
R

h_m

h_{cpu}



Rad zone



Adaptive-grid

$S_{eff}[x]$
2kd

$$S_{\text{eff}}[x] = S[x, h(x)]$$

2bd

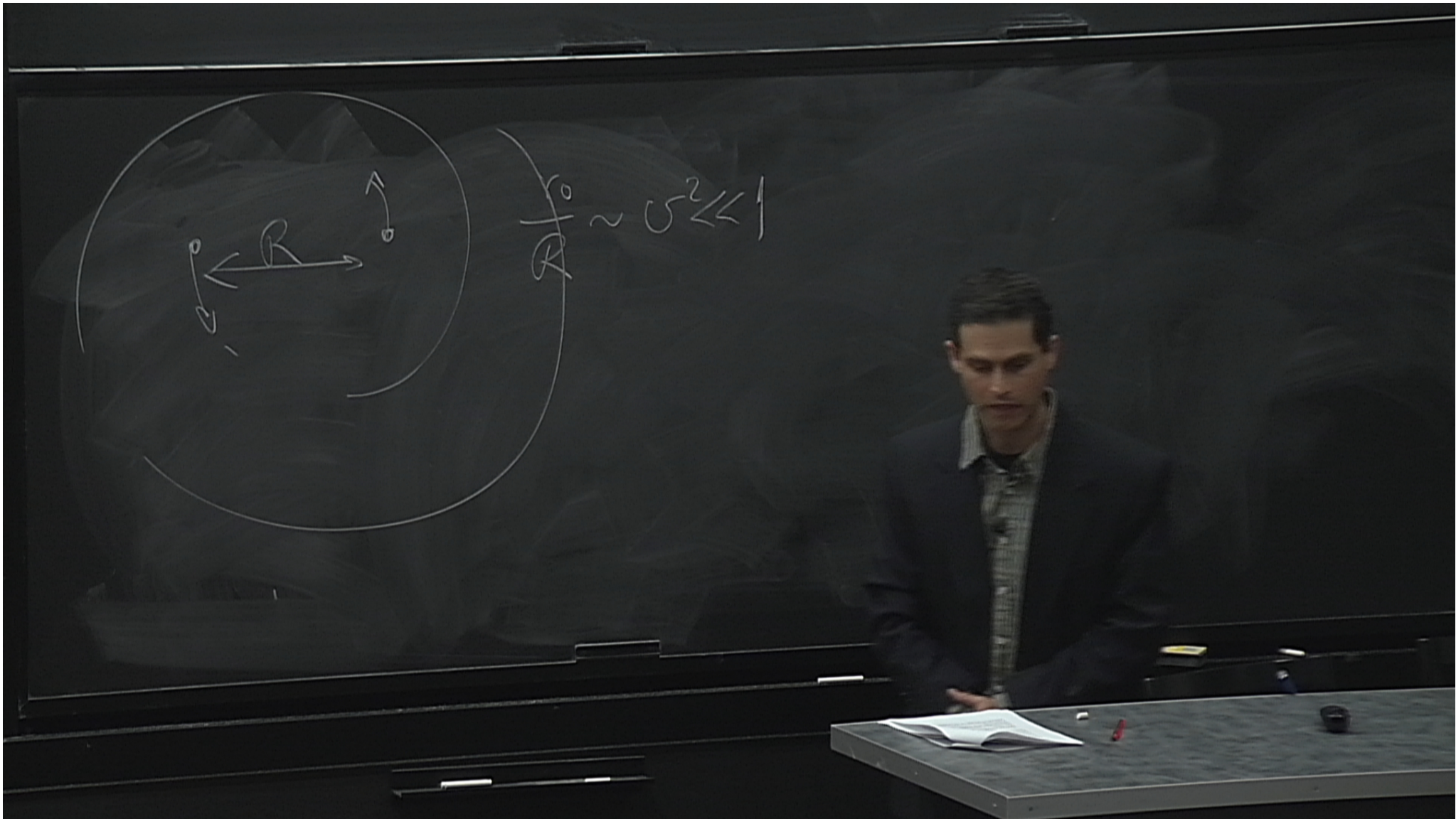
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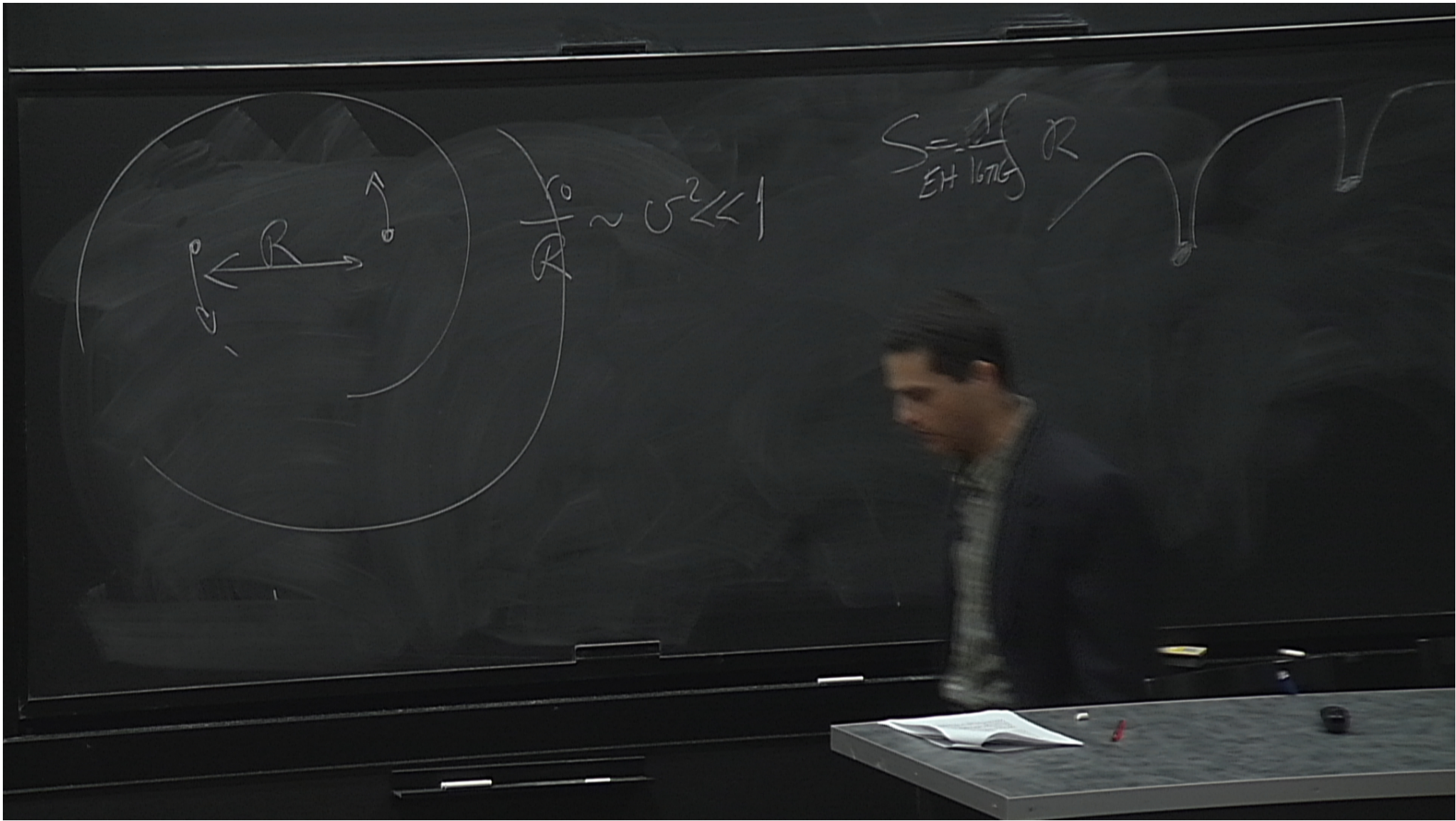
H

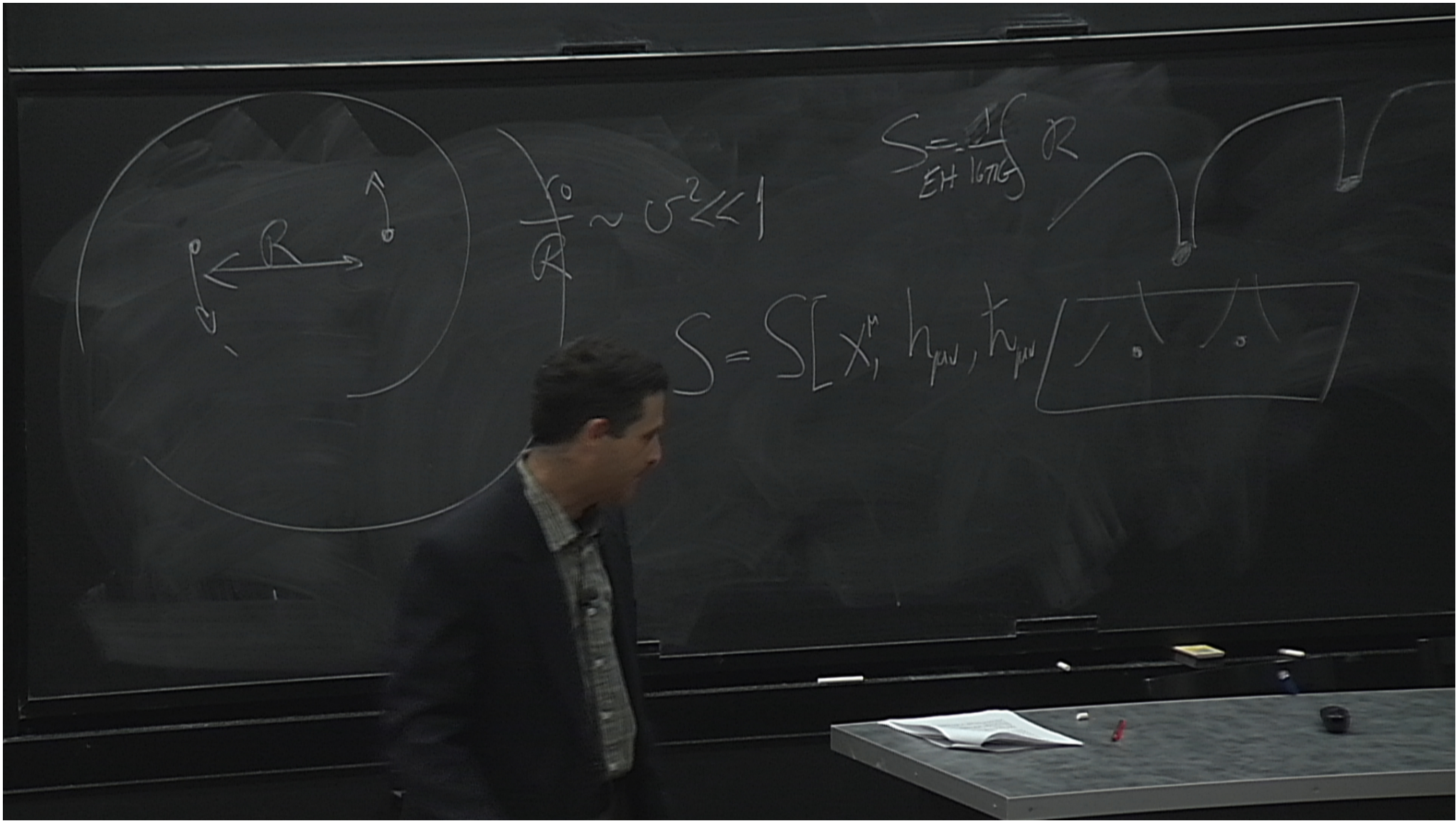
$$-\frac{1}{S_2} = -\frac{1}{k^2}$$

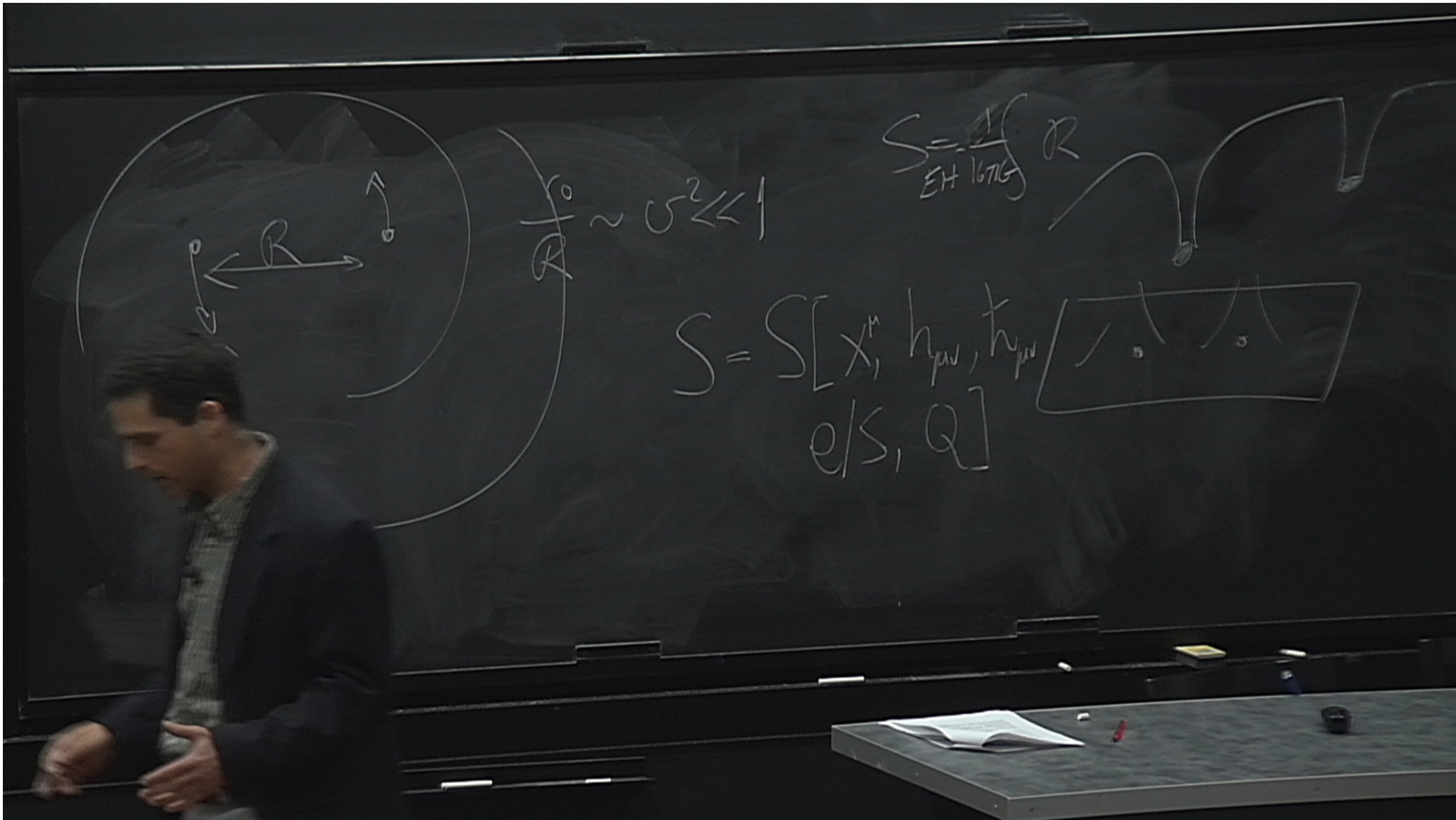
-mft

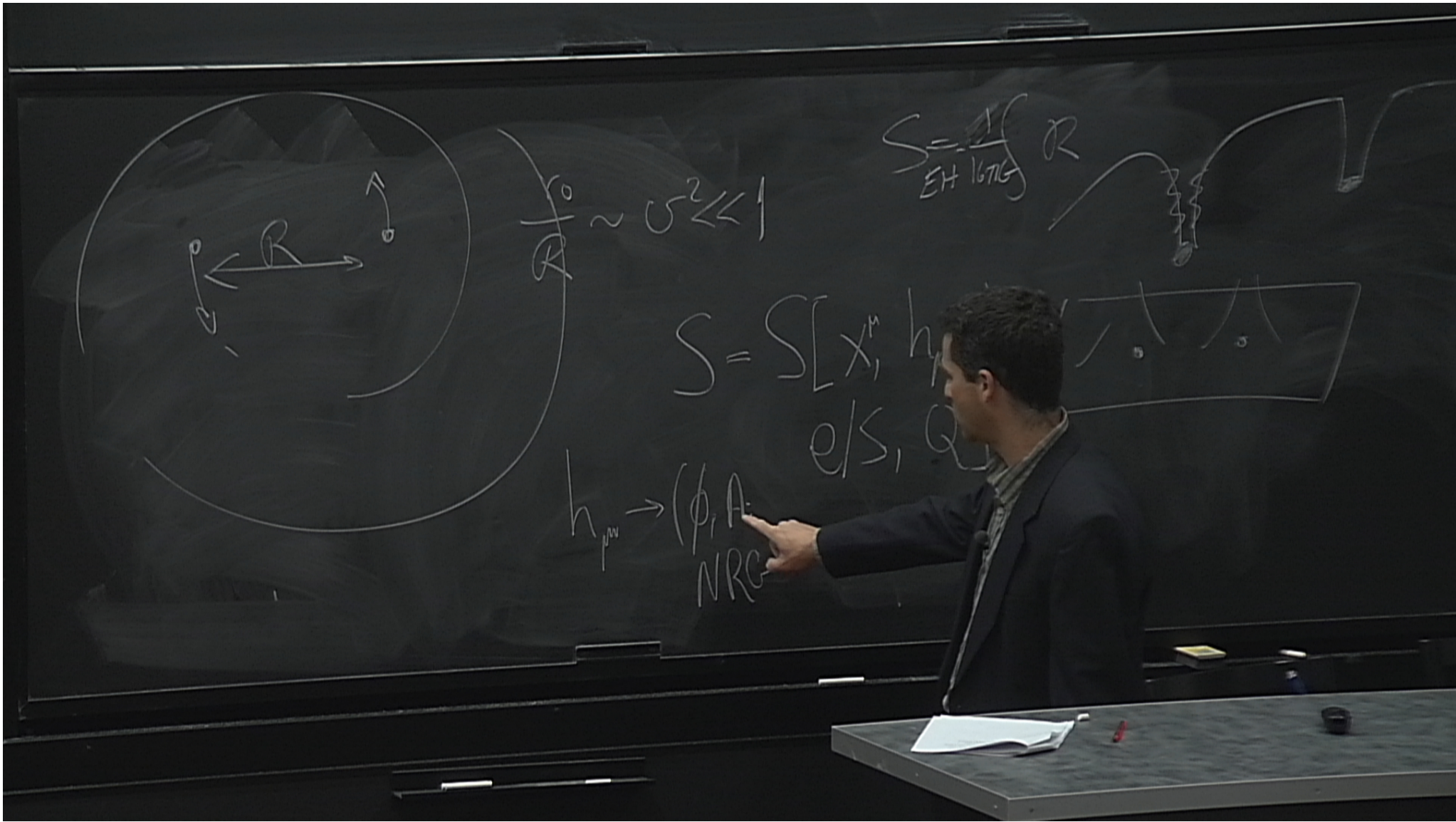


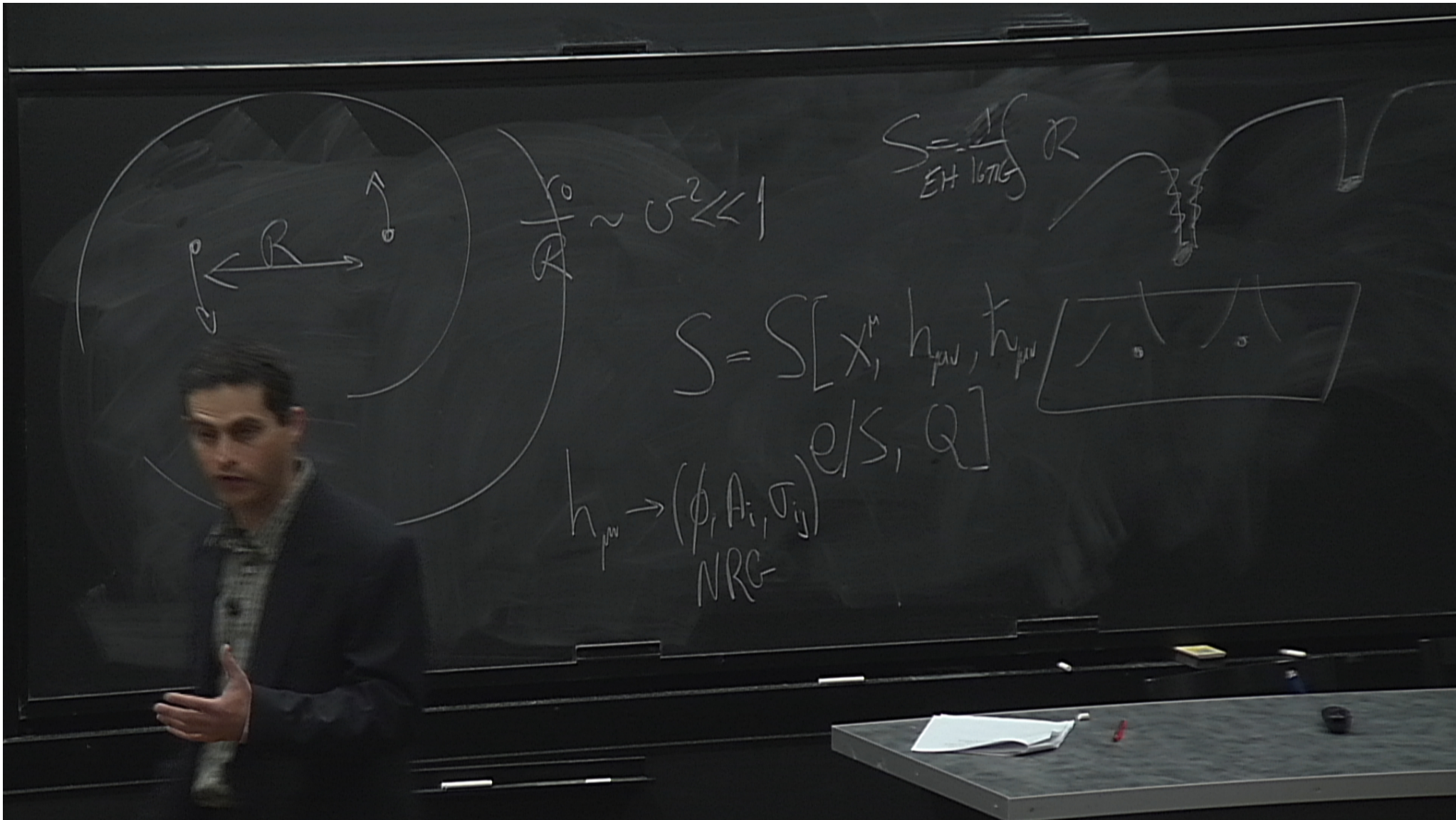










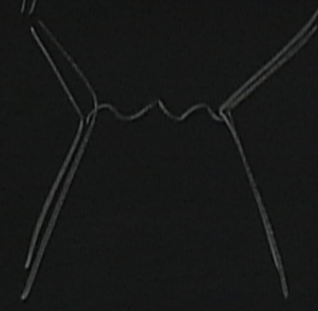


more applications • Summary

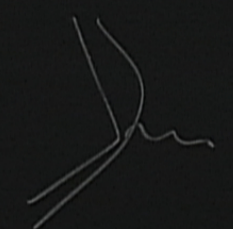
$$S_{eff}[\psi] = \log \int D\phi e^{iS[\phi, \psi]}$$

$$iS[\phi, \psi]$$

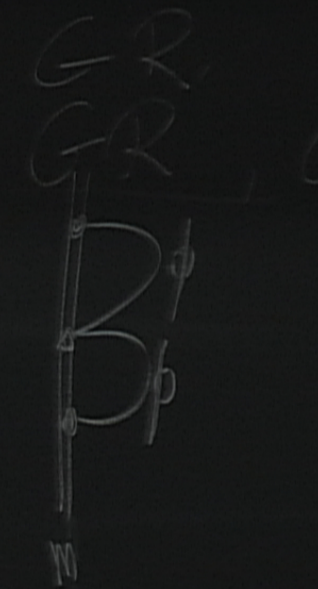
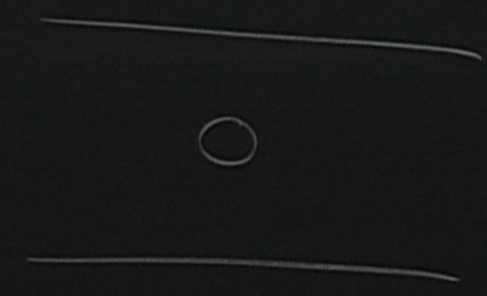
$$S_{GF} = \int \frac{1}{2\pi} (\partial_\mu A^\mu)^2 dx$$



$$\frac{i}{p^2 + i\epsilon}$$



$$-im$$



## Perturbative Classical FT

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S



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$$S_{\text{BH}}$$

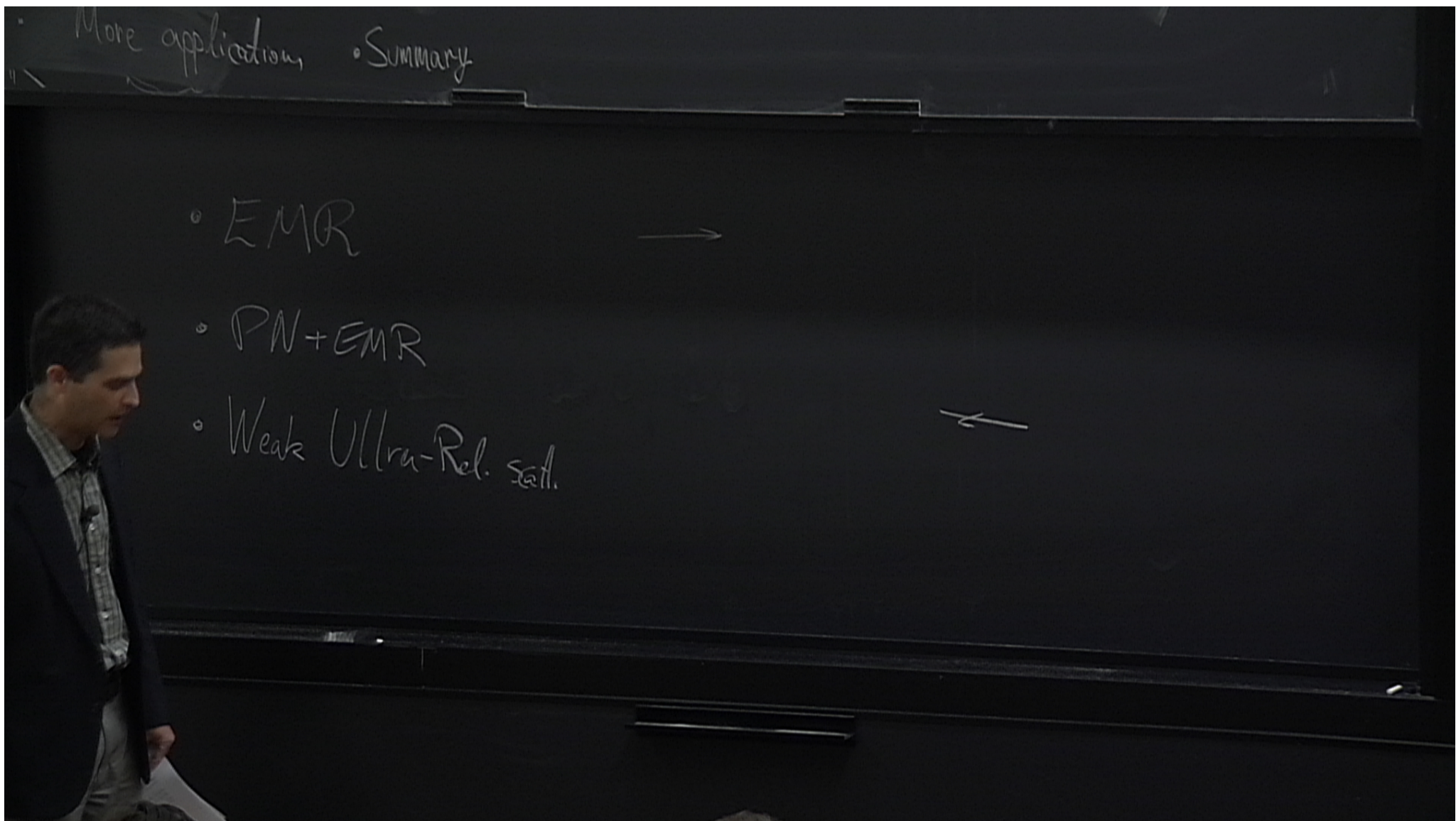


• More applications • Summary

- EMR

- PN+EMR

- Weak Ultra-Rel. sat.



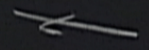
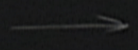
• More applications

• Summary

• EMR

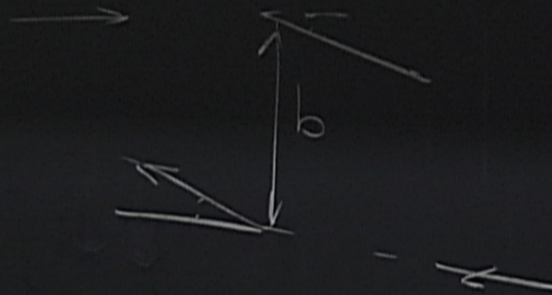
• PN+EMR

• Weak Ultra-Rel. sat.



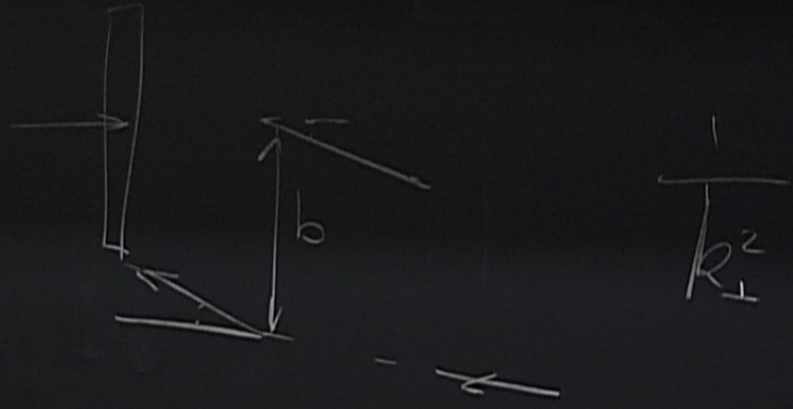
More application, • Summary

- EMR
- PN+EMR
- Weak Ultra-Rel. sat.

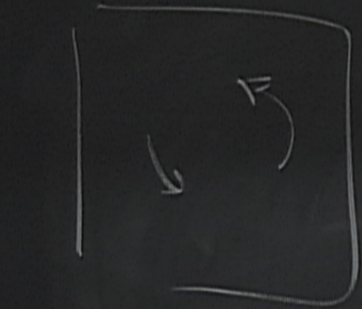


• More application, • Summary

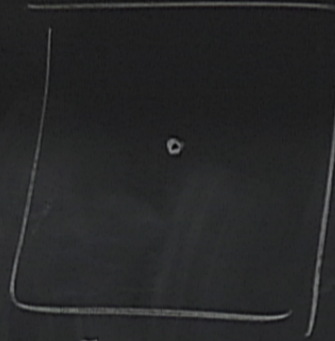
- EMR
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More application, Summary



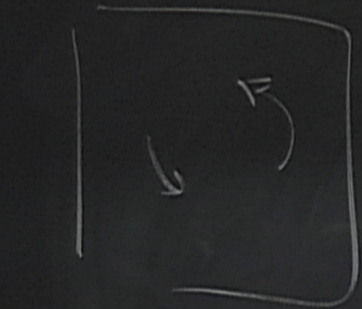
$$\text{Subst } \begin{bmatrix} X_{1,1} \\ X_{1,2} \end{bmatrix}$$



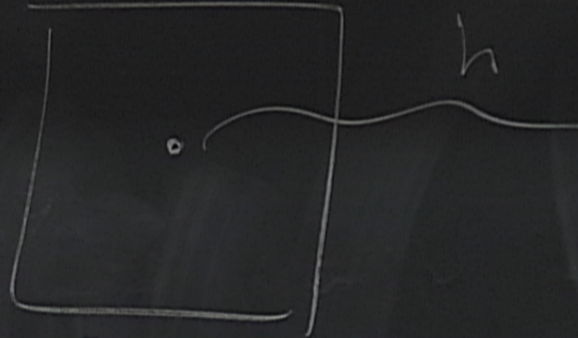
$$Q = Q(t)$$



More applications • Summary



$$\text{Subst } \begin{bmatrix} X_{1,2} \end{bmatrix}$$



$$Q = Q(t)$$

