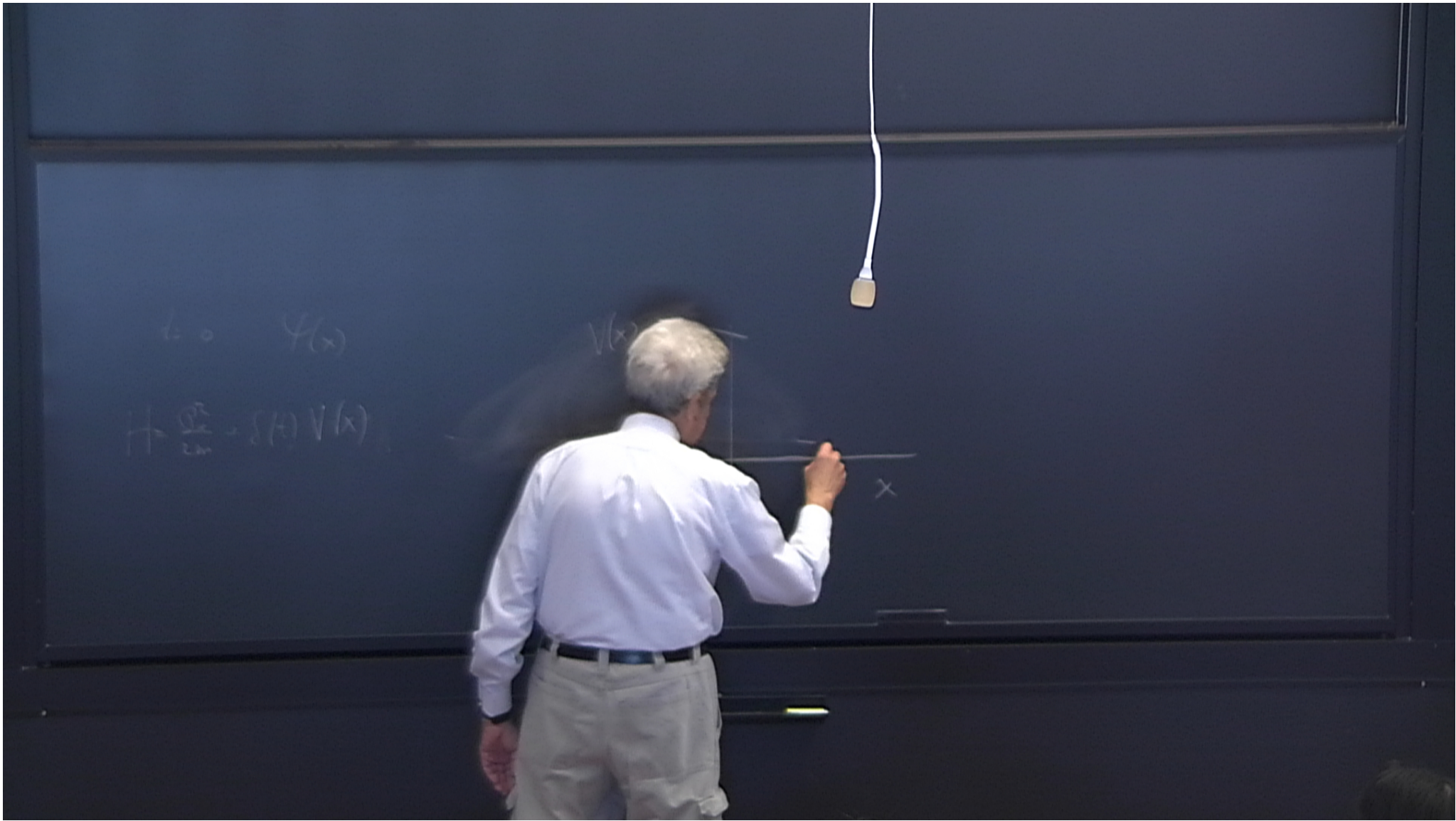


Title: TBA

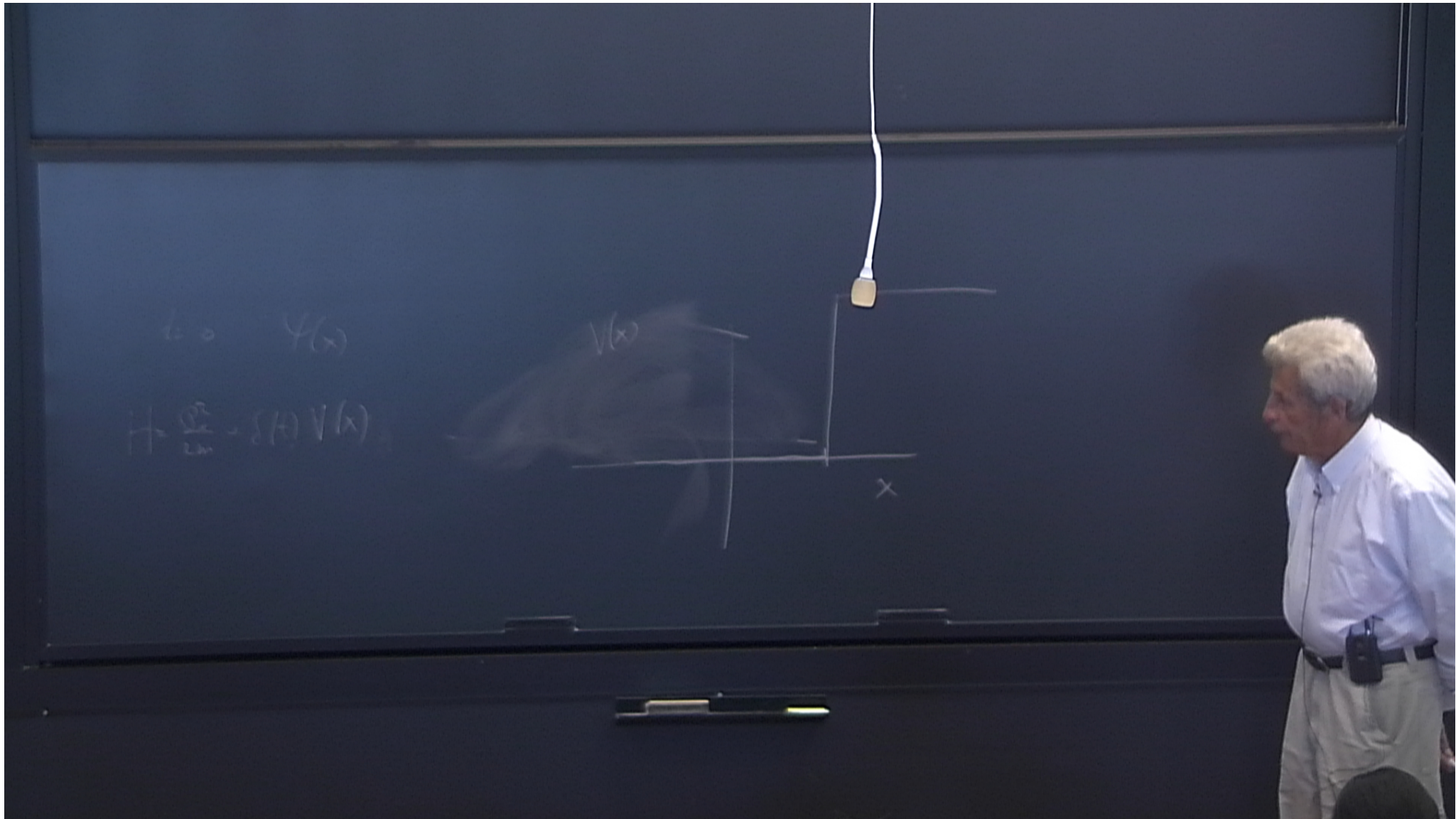
Date: Jun 10, 2016 10:00 AM

URL: <http://pirsa.org/16060083>

Abstract:





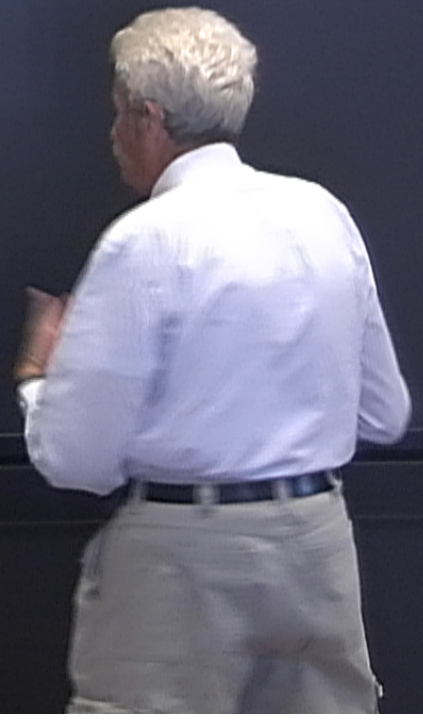
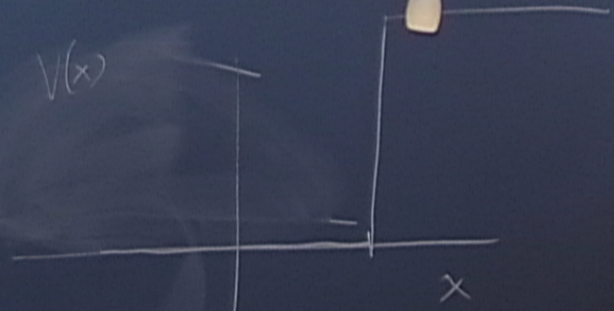




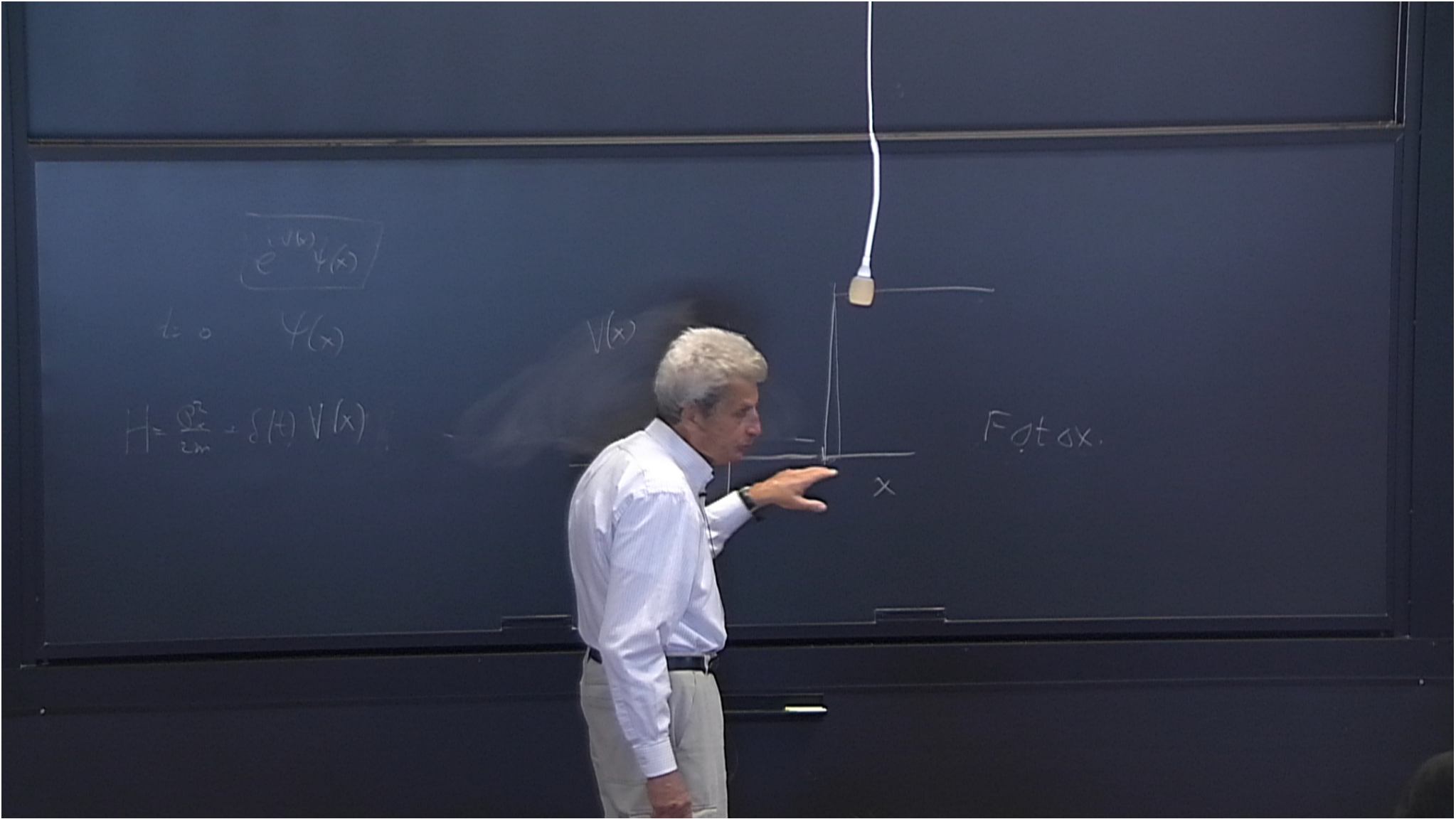
$$e^{iV(x)} \psi(x)$$

$$t=0 \quad \psi(x)$$

$$H = \frac{p^2}{2m} + V(x)$$





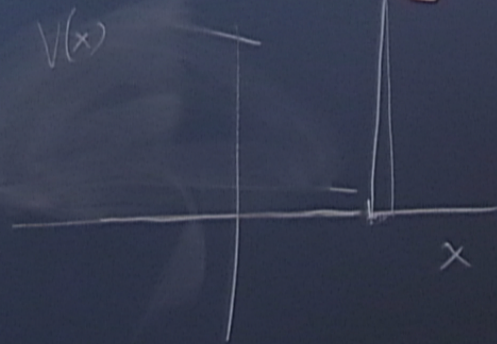




$$e^{iV(x)} \psi(x)$$

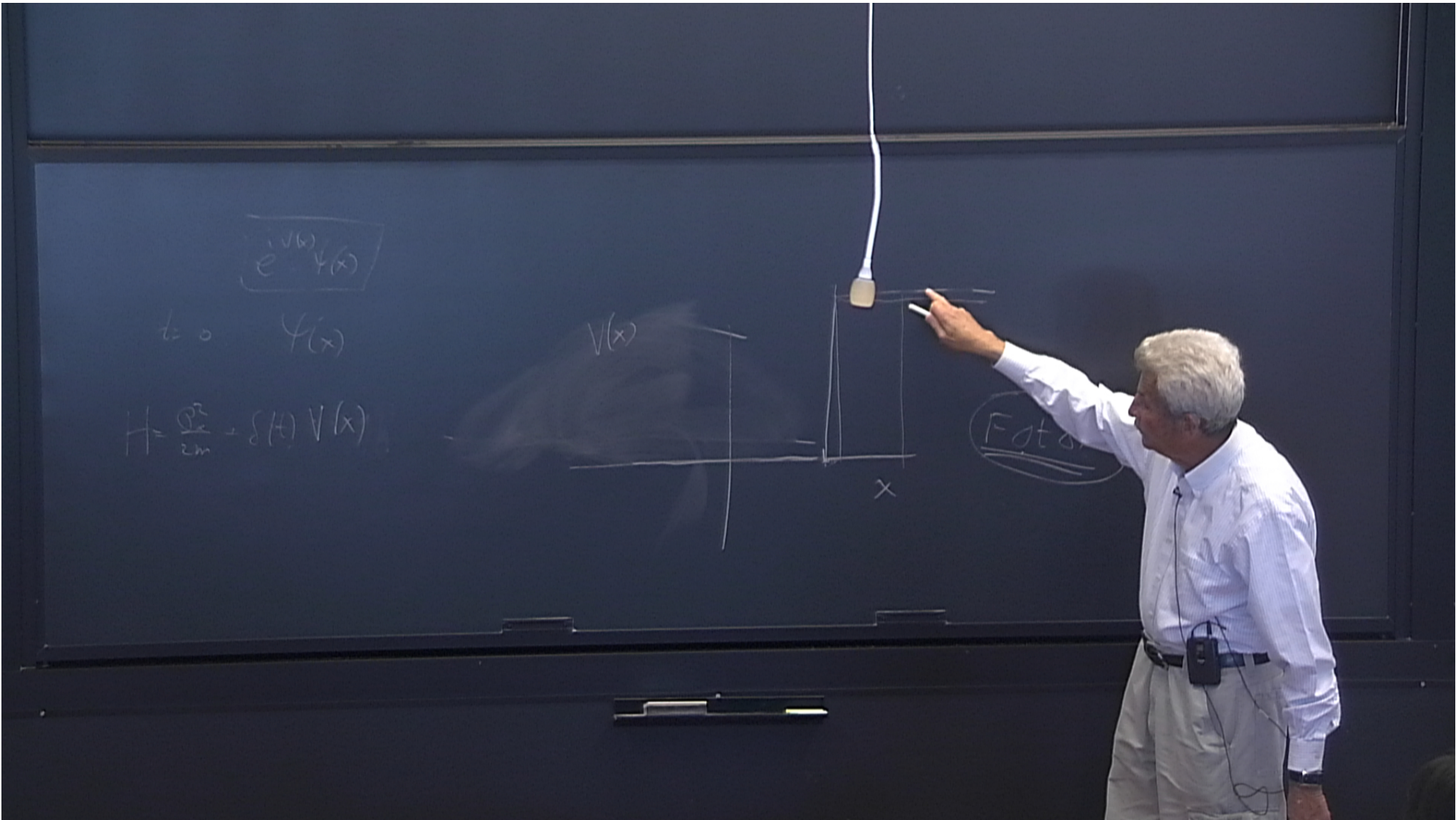
$$t=0 \quad \psi(x)$$

$$H = \frac{p^2}{2m} + \delta(x) V(x)$$

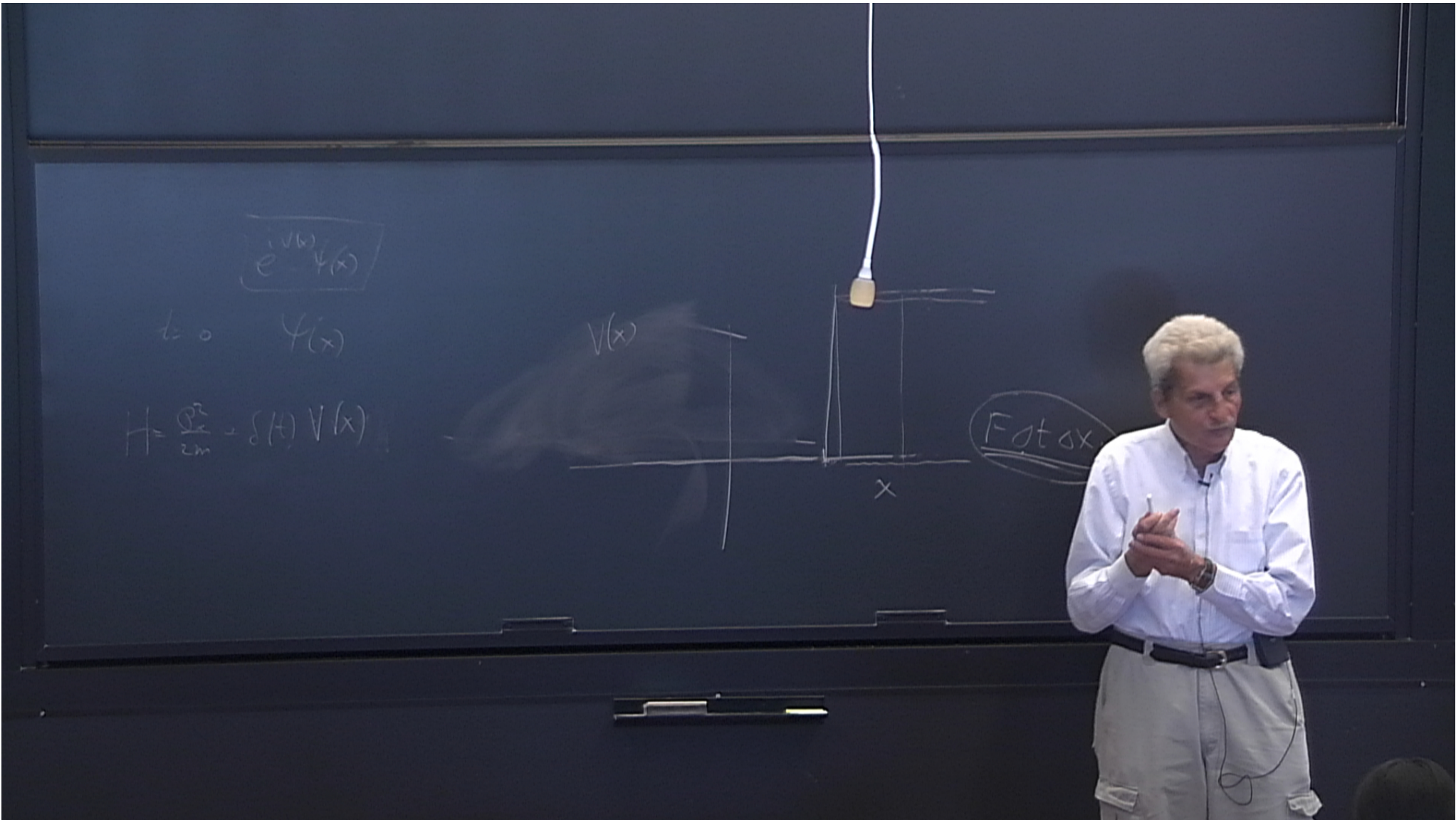


Fotox.









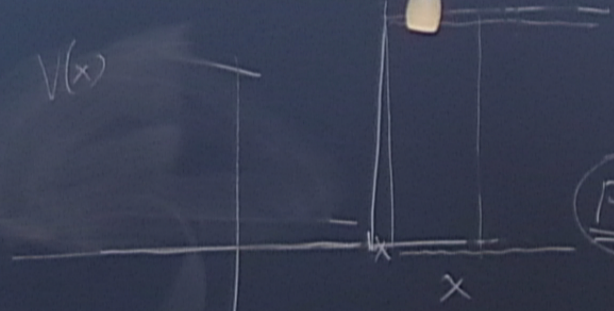


$$e^{iV(x)} \psi(x)$$

$$t=0 \quad \psi(x)$$

$$H = \frac{p^2}{2m} + \delta(x) V(x)$$

$V(x)$



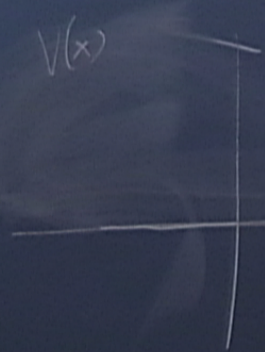
Fotax.



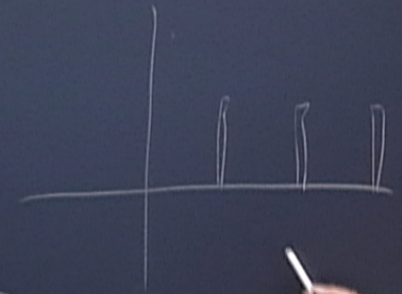
$$\boxed{e^{-i\omega t} \psi(x)}$$

$$t=0 \quad \psi(x)$$

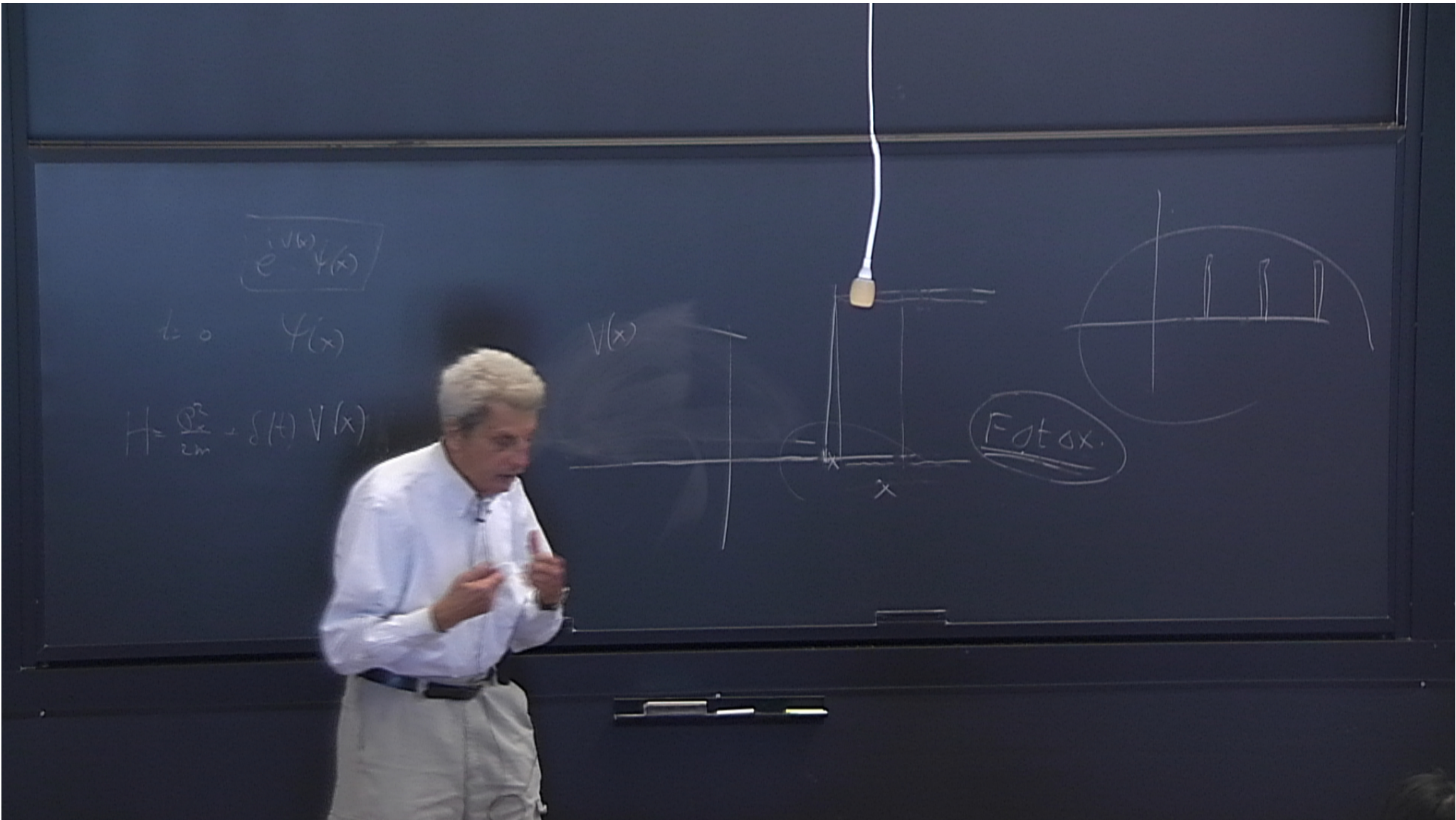
$$H = \frac{p^2}{2m} + \delta(x) V(x)$$



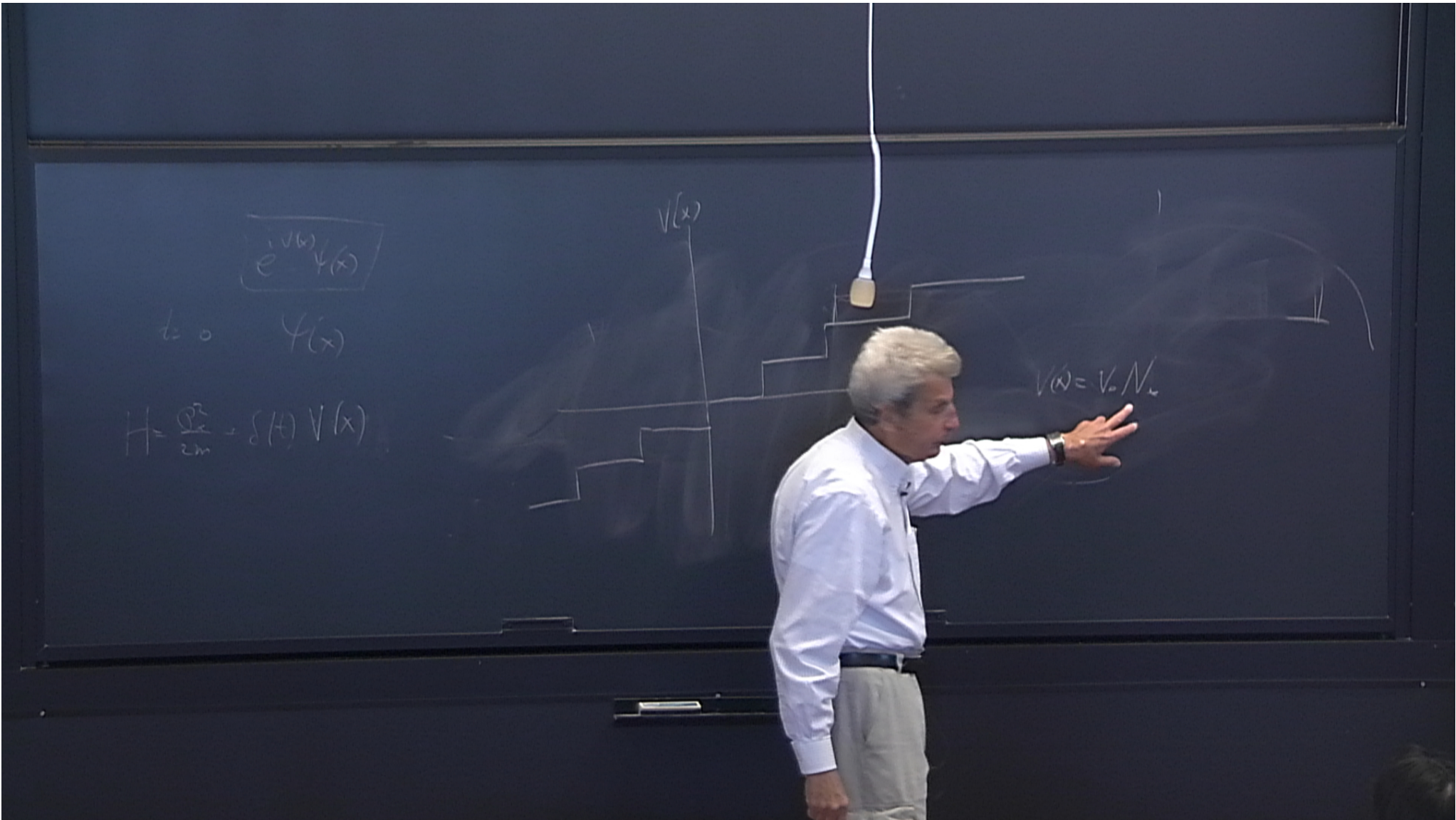
Fotox.



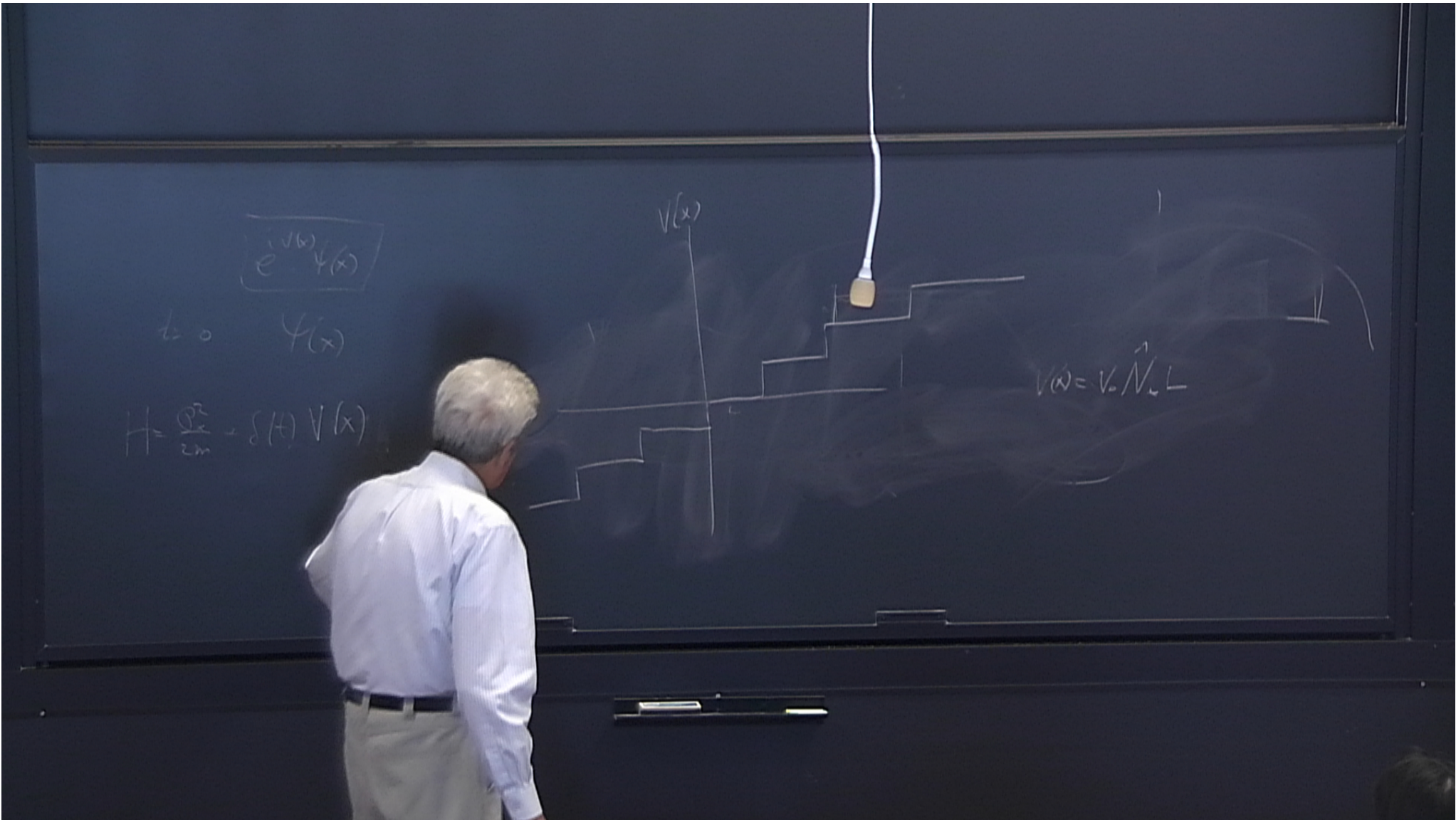




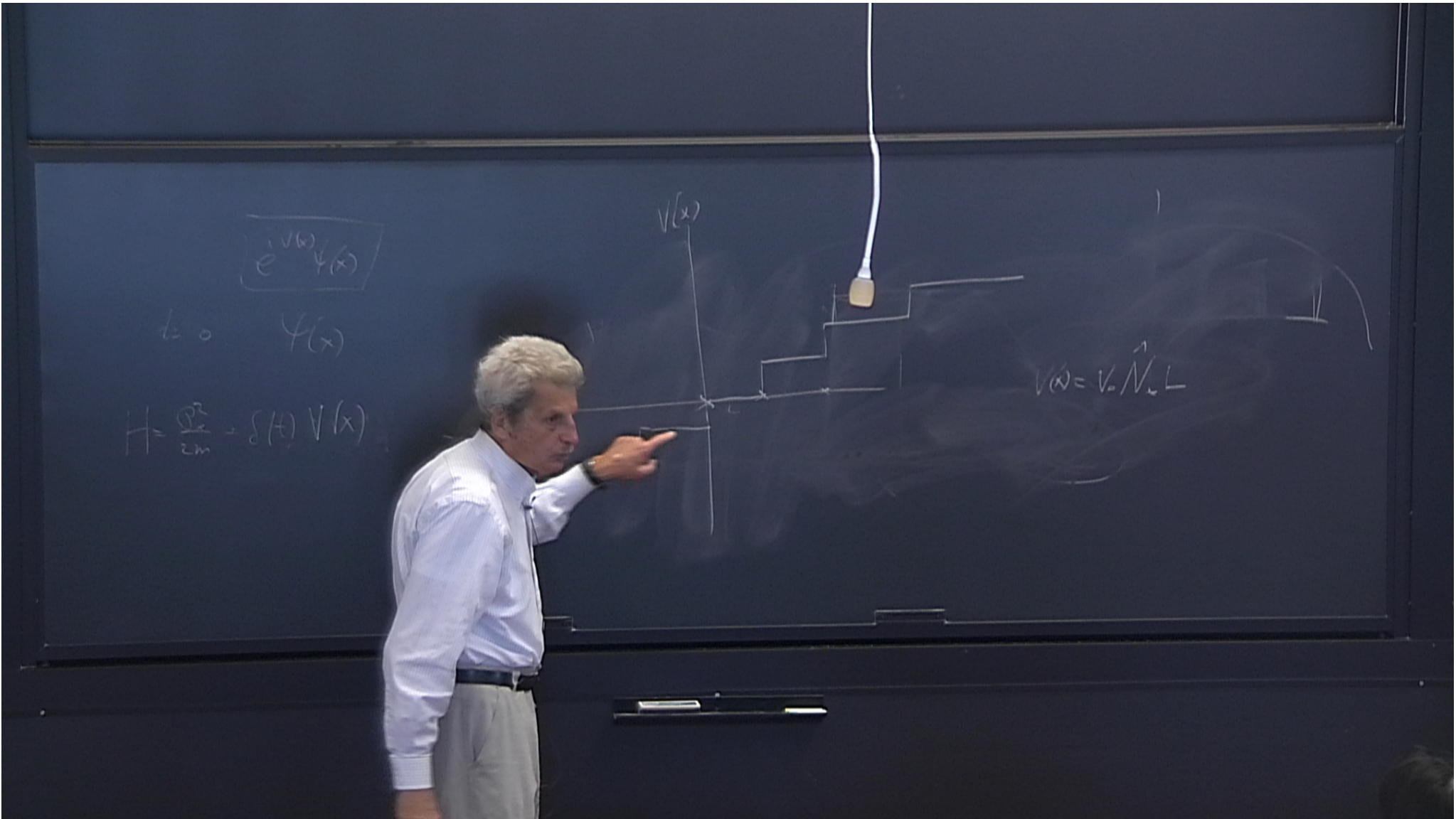




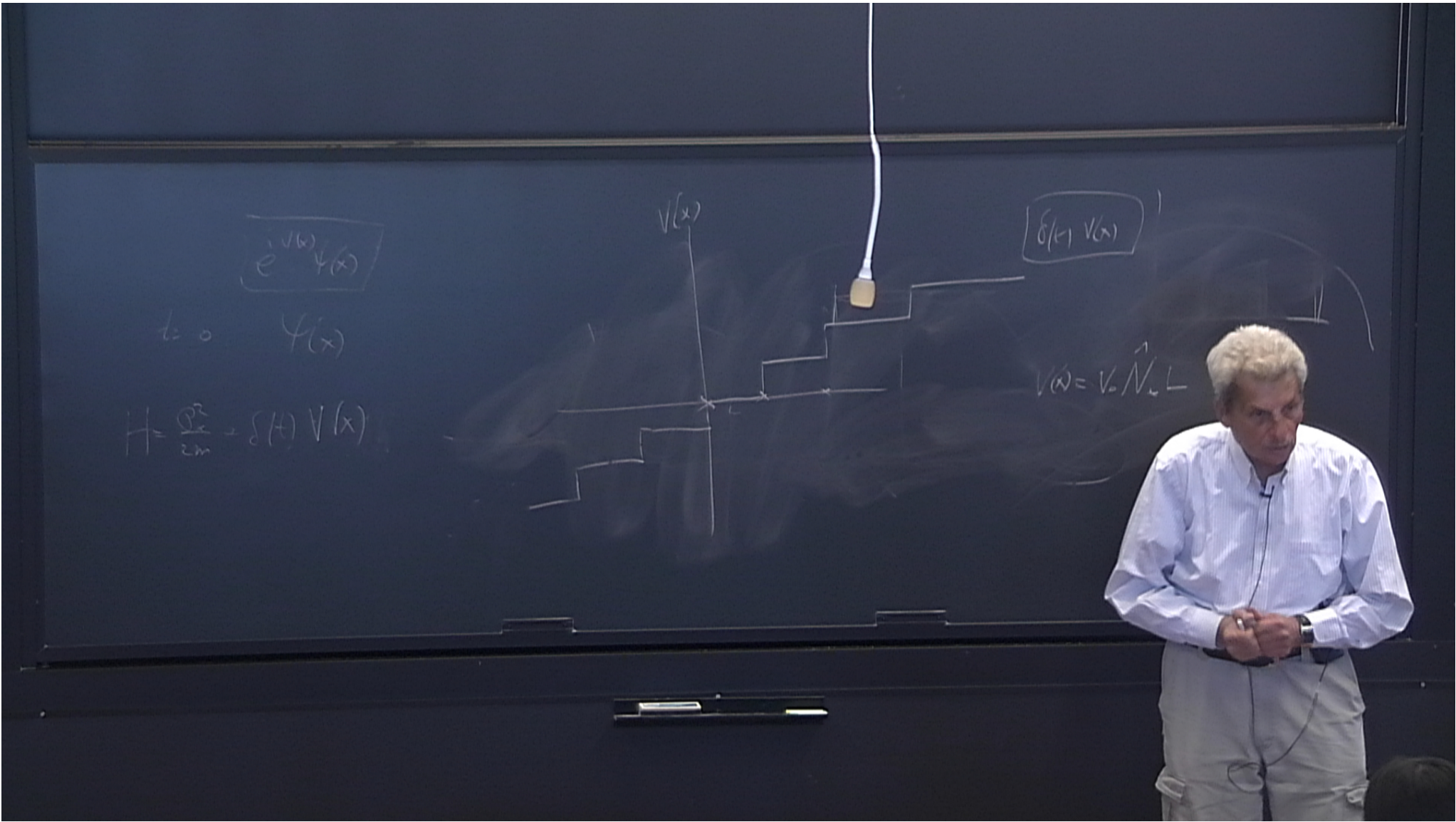










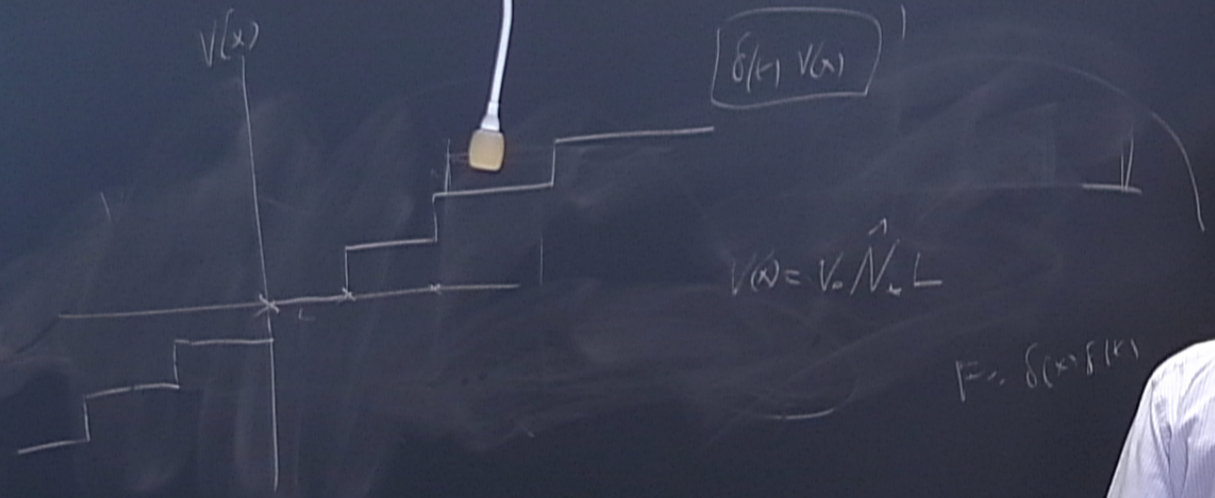




$$e^{-iV(x)} \psi(x)$$

$$t=0 \quad \psi(x)$$

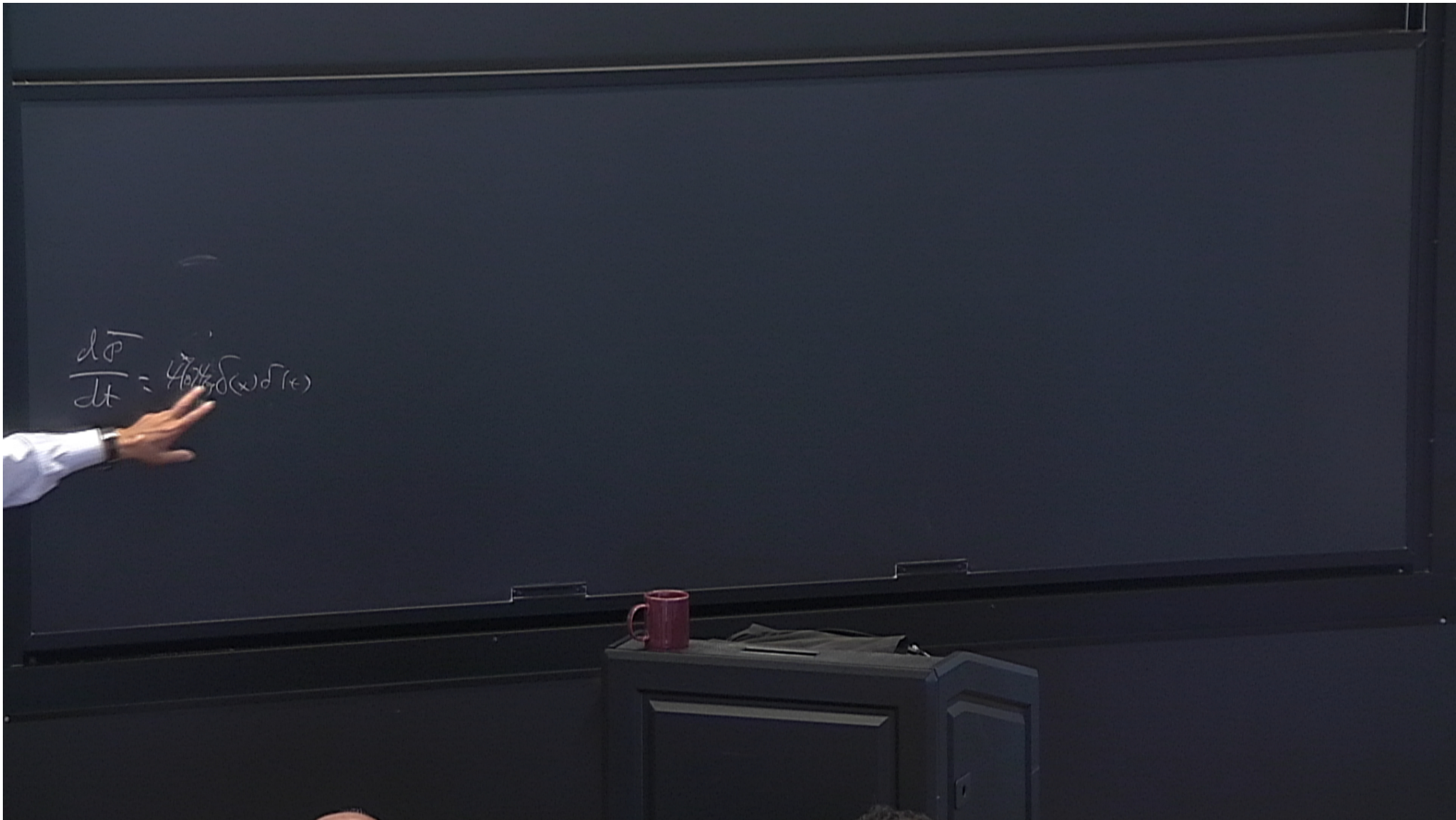
$$H = \frac{p^2}{2m} + V(x)$$





$$\frac{d\bar{p}}{dt} = \int \bar{F}(\omega) d\Gamma(\omega)$$







$$\frac{d\bar{p}}{dt} = 4\pi r_0^2 \delta(\omega) \delta(\epsilon) V_0$$



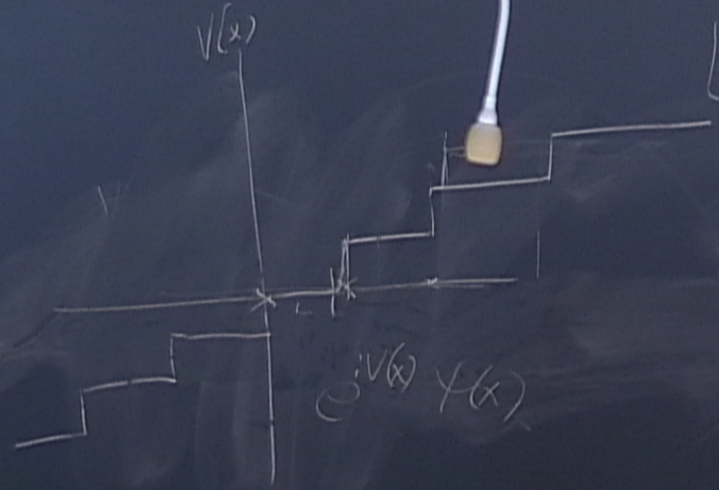
$$\int \frac{d\vec{p}}{dt} = 4\pi \frac{1}{3} \delta(\omega) \delta(\epsilon) V_0$$



$$e^{iV(x)} \psi(x)$$

$$t=0 \quad \psi(x)$$

$$H = \frac{p^2}{2m} + \delta(t) V(x)$$

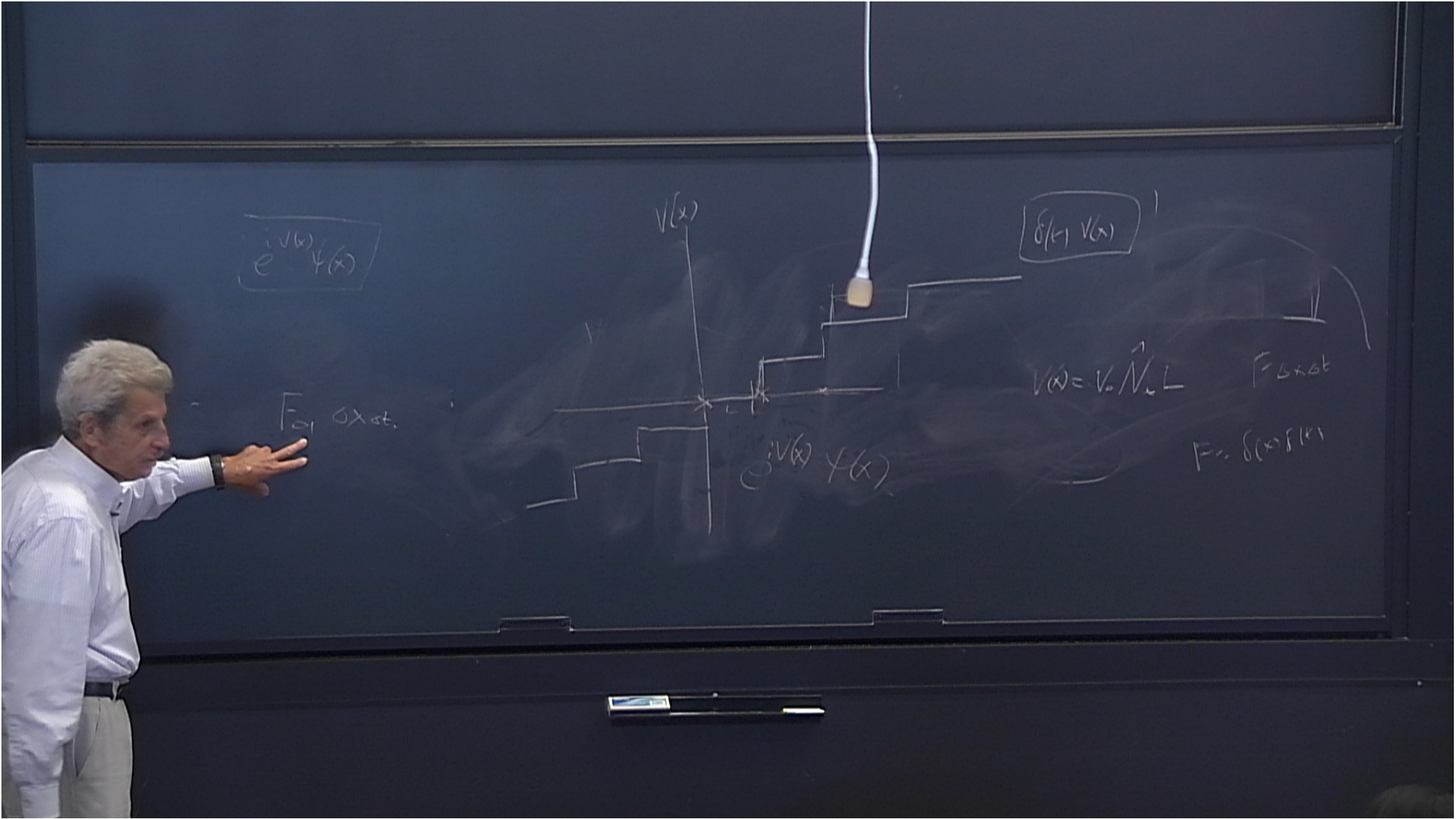


$$\delta(t) V(x)$$

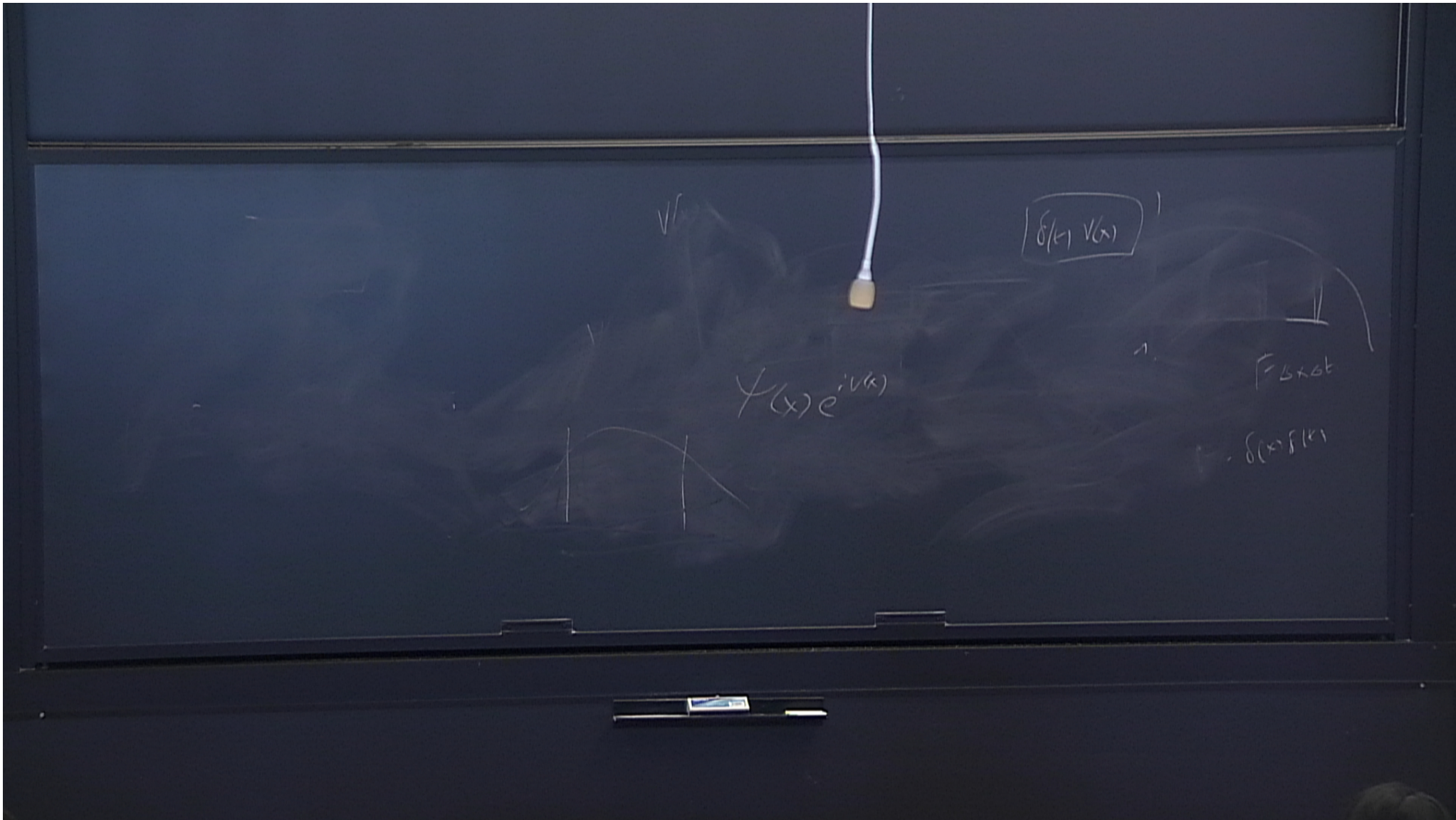
$$V(x) = V_0 \vec{N}_L \quad T = \delta + \delta t$$

$$F = \delta(x) \delta(t)$$

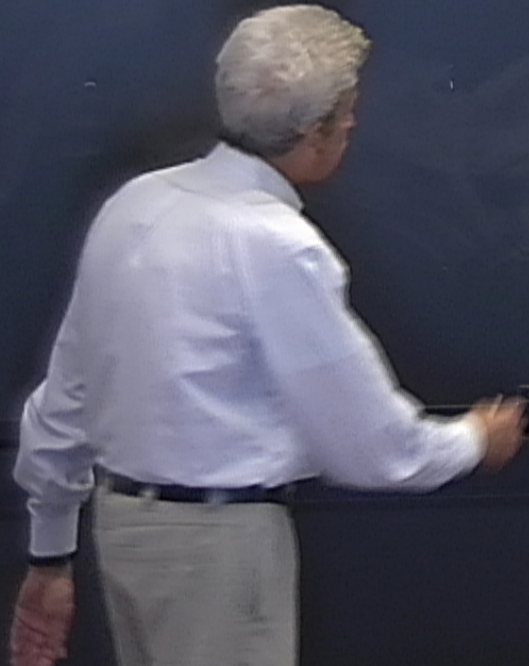












$$\hat{X} = \hat{N}_x X_0 +$$

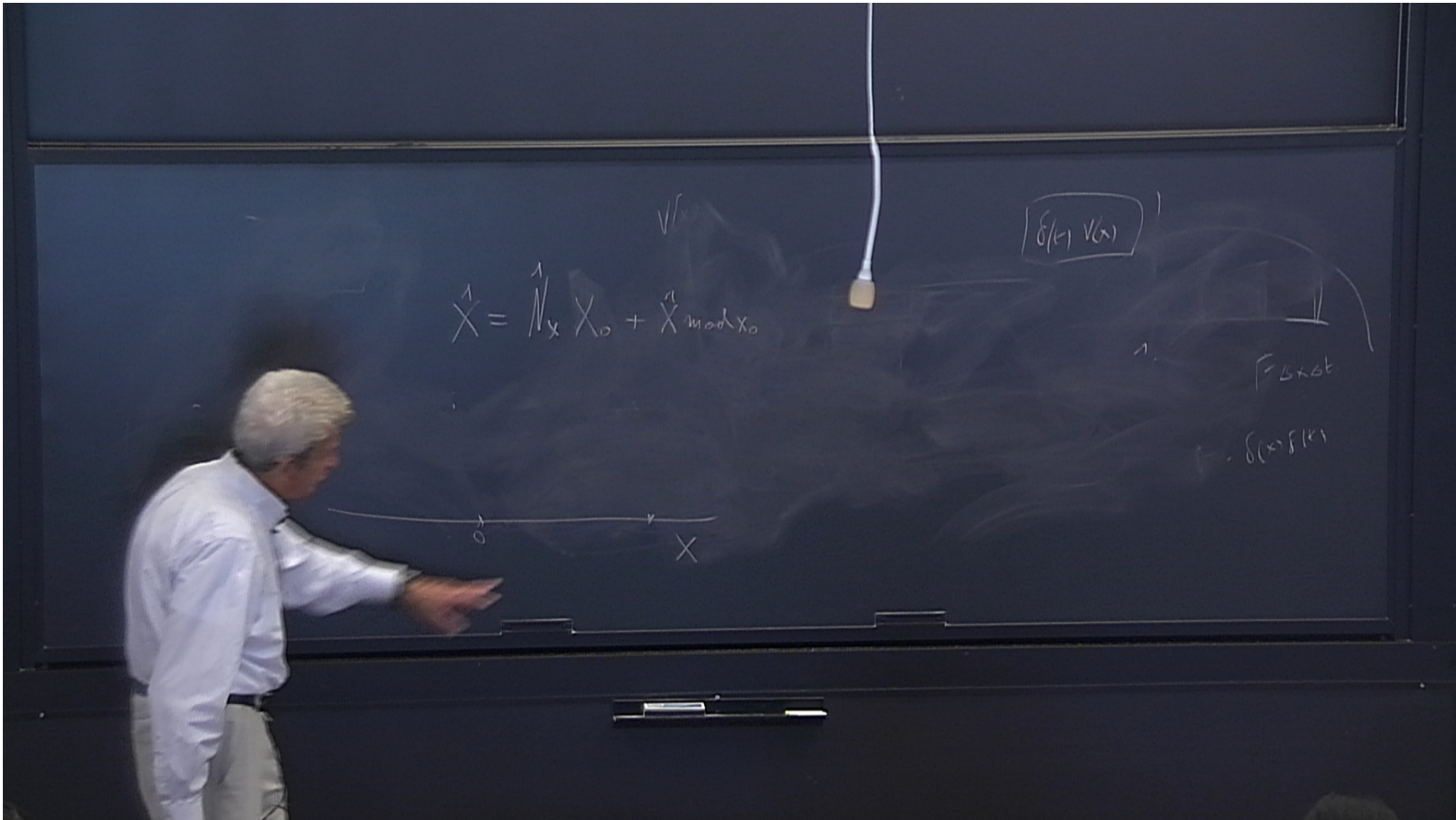
$\sqrt{V}$

$$\delta(t) \sqrt{V(t)}$$

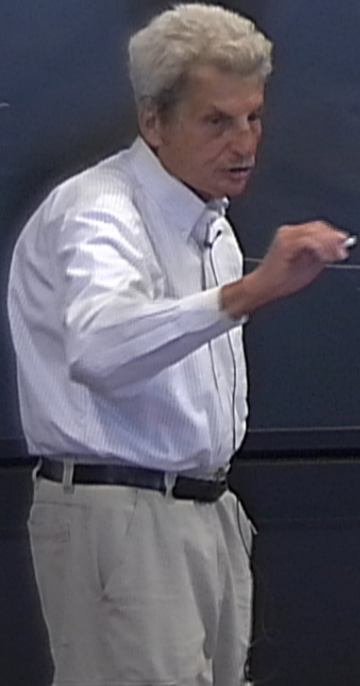
$$F(t) + \delta t$$

$$F - \delta(t) \delta(t)$$









$$\hat{X} = \sum_{x=0}^{\hat{N}_x} X_0 + \hat{X}_{\text{mod } X_0}$$

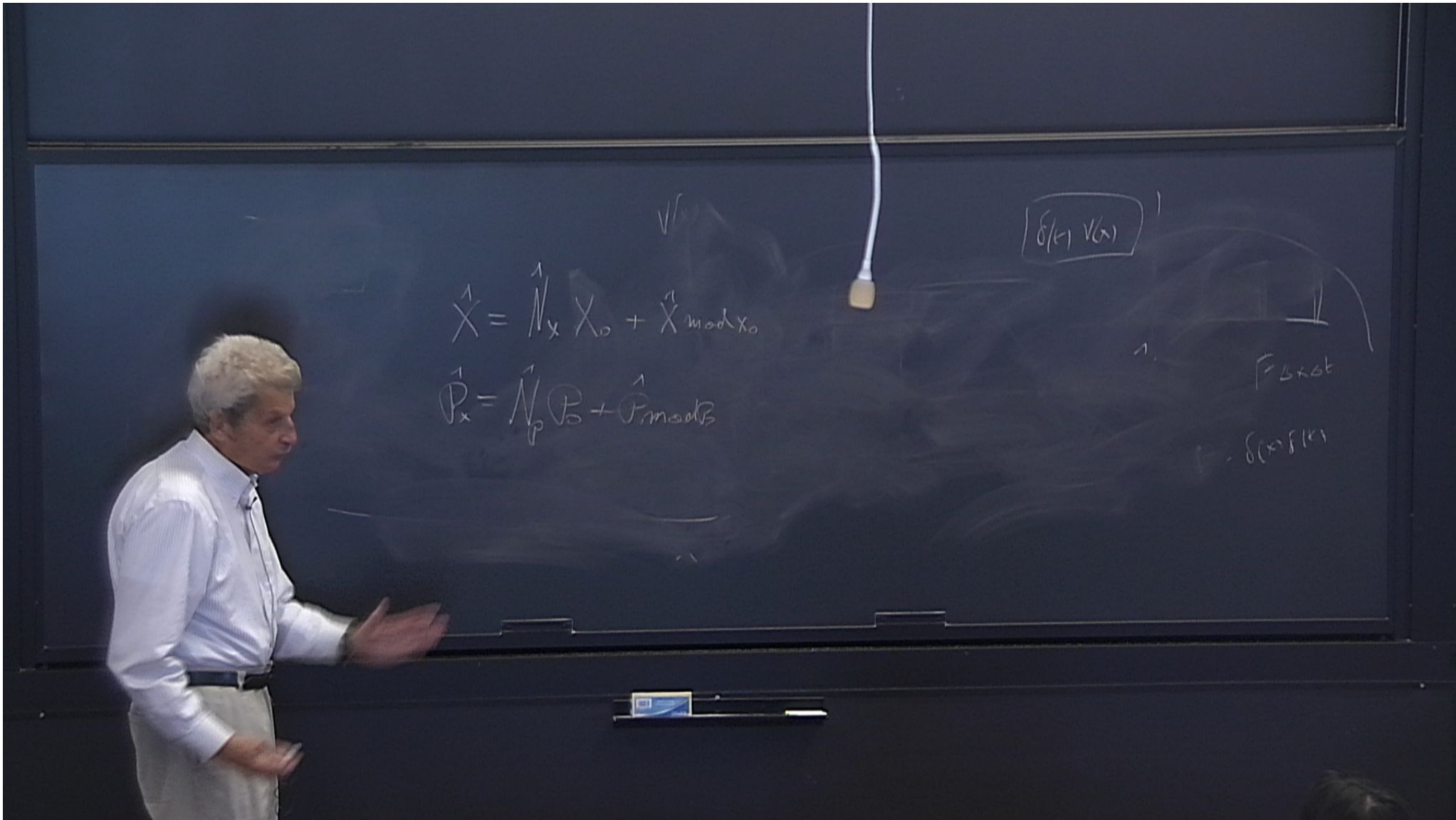
$$\delta(k) \nu(k)$$



$$F_{\Delta t \times \Delta t}$$

$$\delta(k) \delta(k)$$





$$\hat{X} = \hat{N}_x X_0 + \hat{X}_{\text{mod } X_0}$$

$$\hat{P}_x = \hat{N}_p P_0 + \hat{P}_{\text{mod } P_0}$$

$$S(k) V(k)$$

$$F_{b+bt}$$

$$S(k) S(k)$$



$$\hat{X} = \hat{N}_x X_0 + \hat{X}_{\text{mod } X_0}$$

$$\hat{P}_x = \hat{N}_p P_0 + \hat{P}_{\text{mod } P}$$

$$X_0 \beta_0 = h$$



$$f(x), g(p) = 0$$

$$f(x), g(p) \in \mathbb{F}_B$$

$$\hat{X} = \hat{N}_x X_0 + \hat{X}_{\text{mod } X_0}$$
$$\hat{P}_x = \hat{N}_p P_0 + \hat{P}_{\text{mod } P_0}$$

$$X_0 P_0 = h$$



$$f(x), g(p) = 0$$

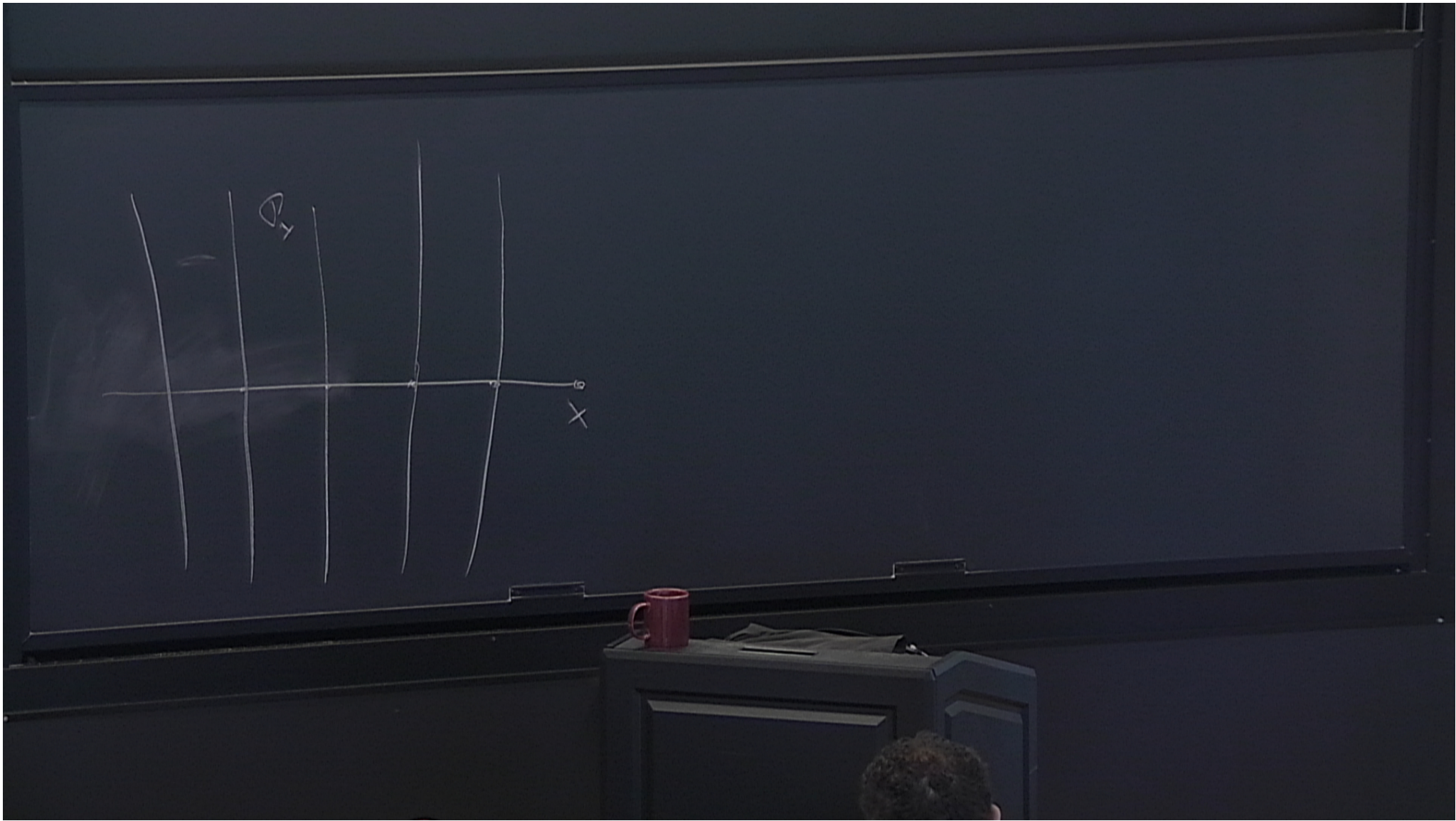
$$f(x), g(p) \in \mathbb{F}_B$$

$$\hat{X} = \hat{N}_x X_0 + \hat{X}_{\text{mod } X_0}$$

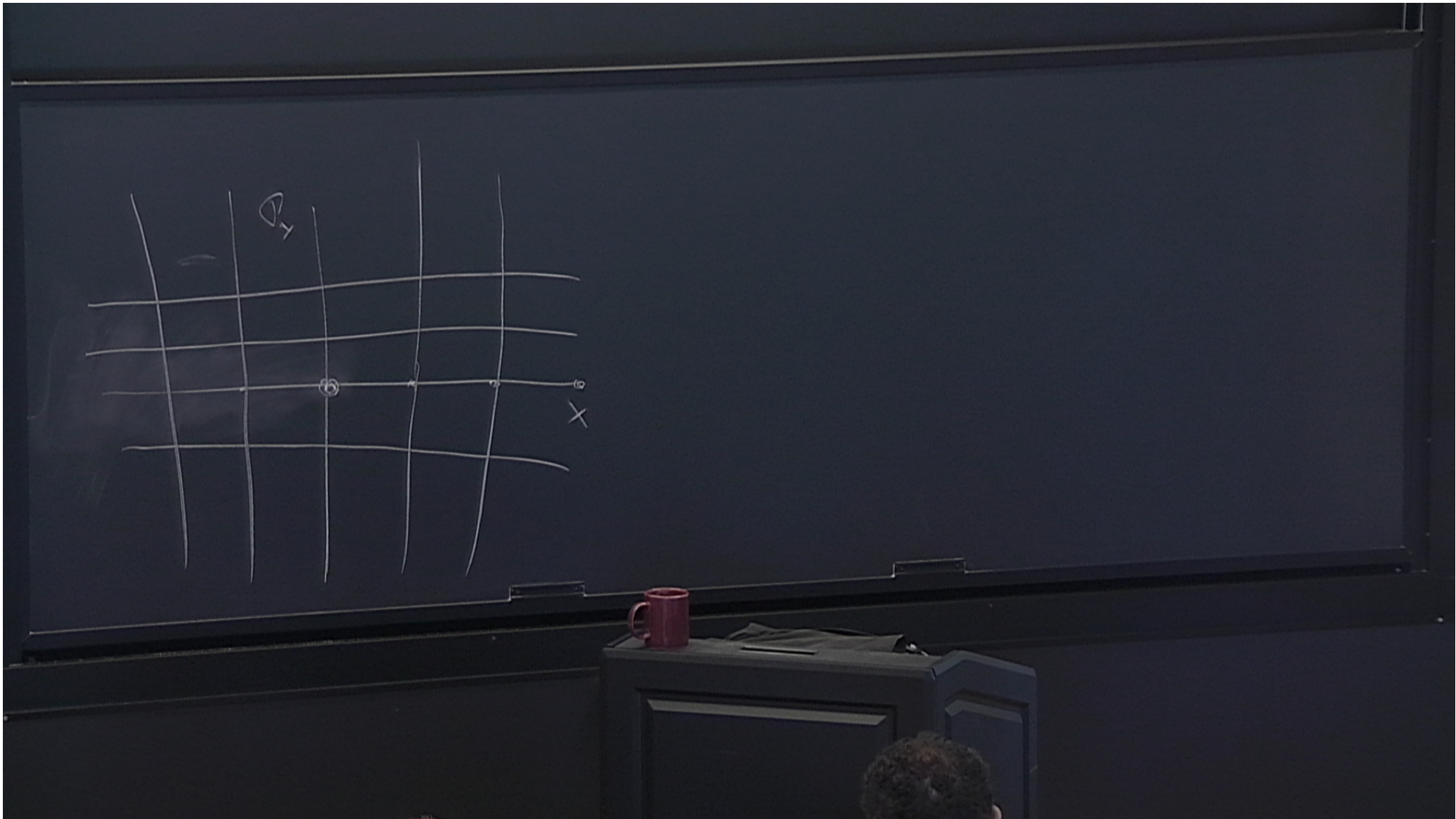
$$\hat{P}_x = \hat{N}_p P_0 + \hat{P}_{\text{mod } P_0}$$

$$0 = \left[ \hat{X}_{\text{mod } X_0}, \hat{P}_{\text{mod } P_0} \right]$$

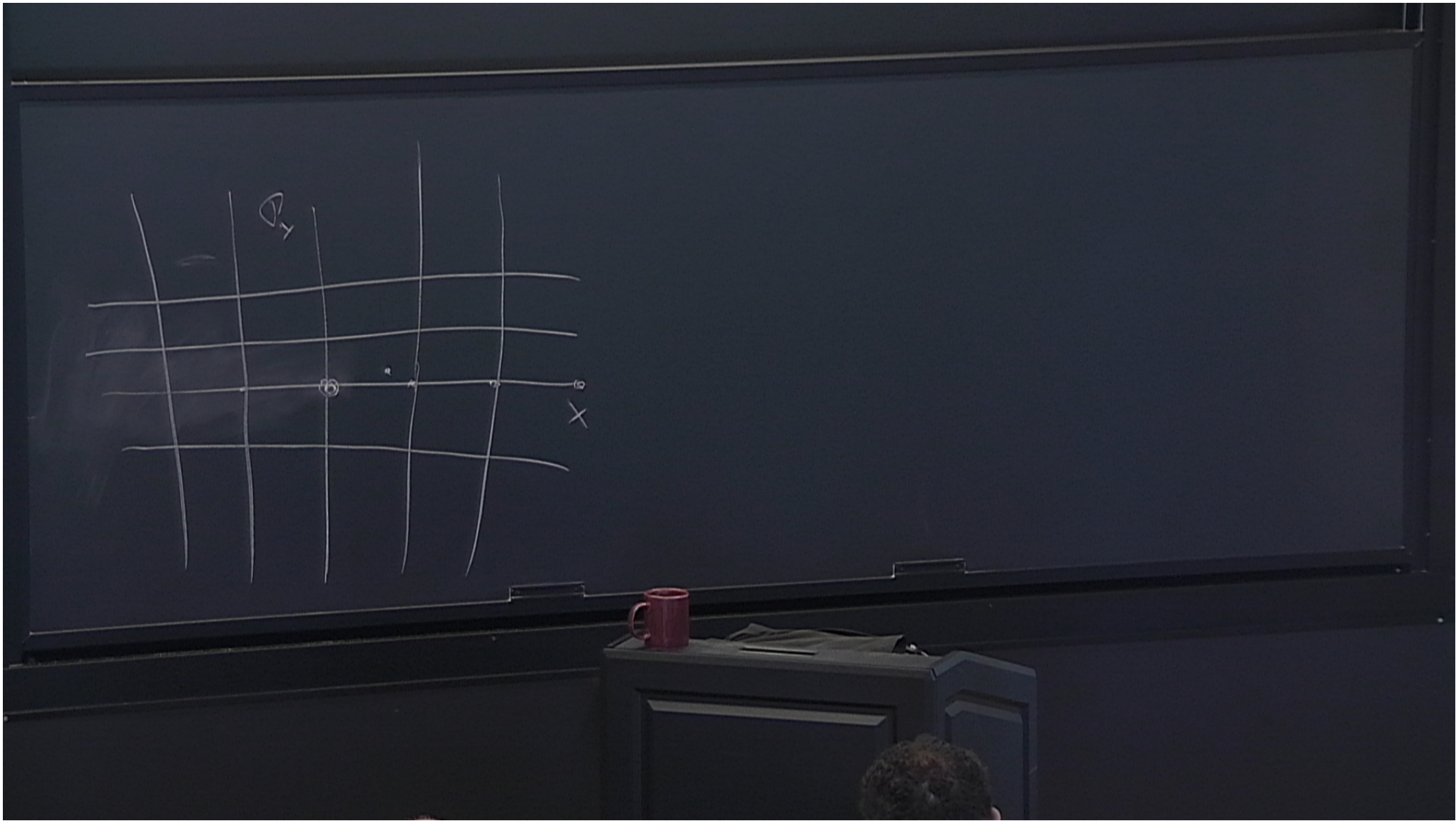




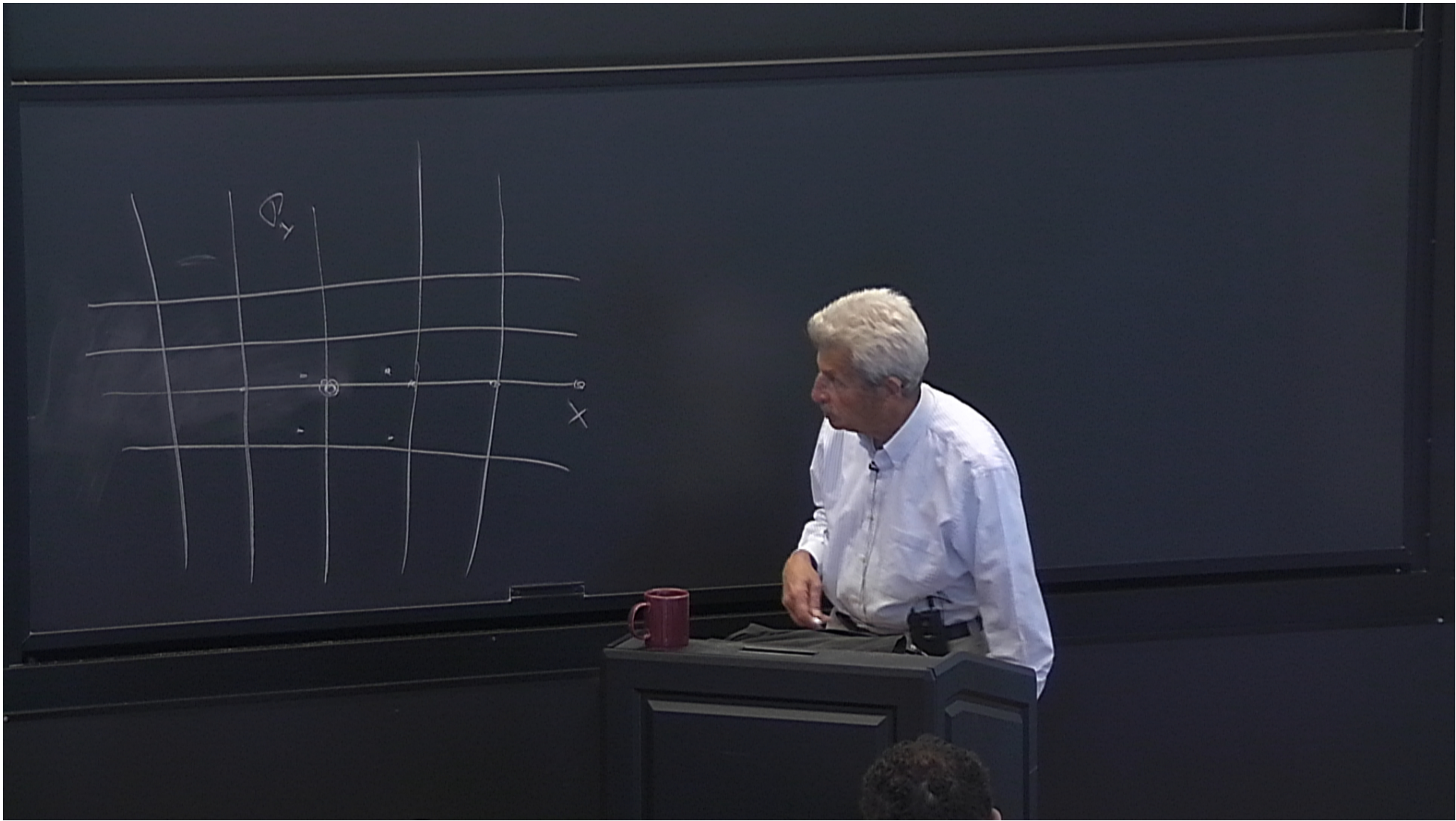




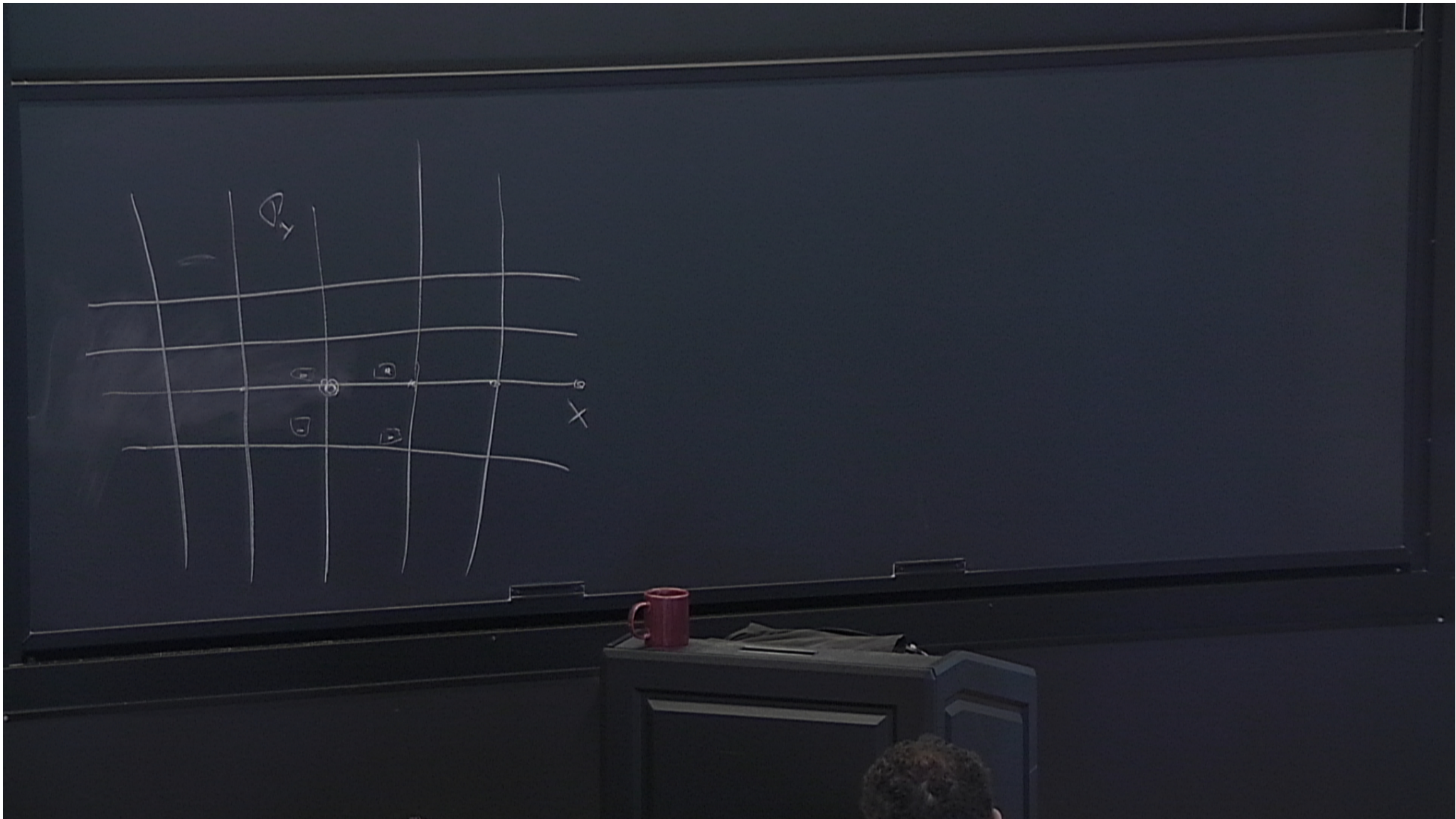








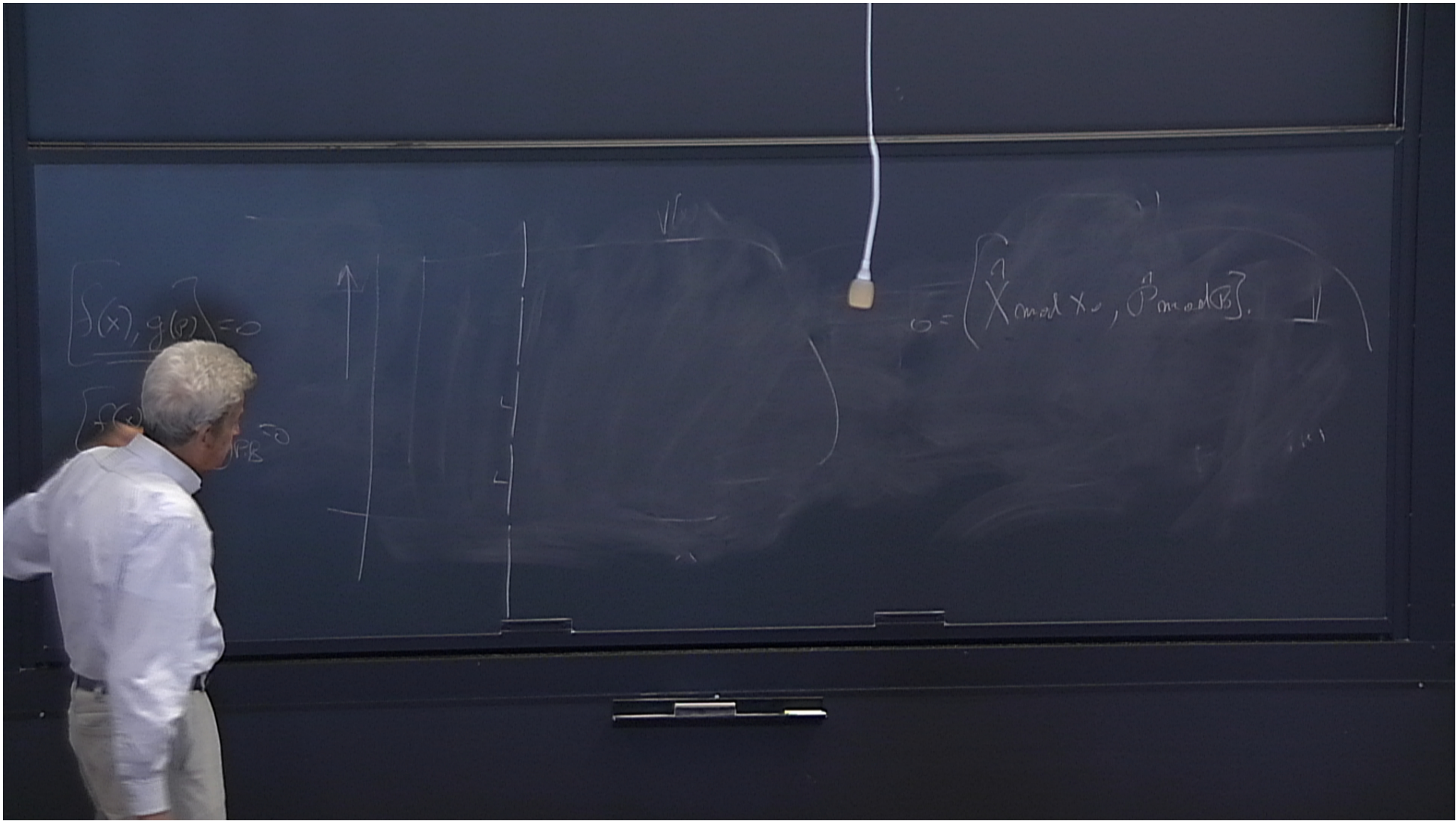




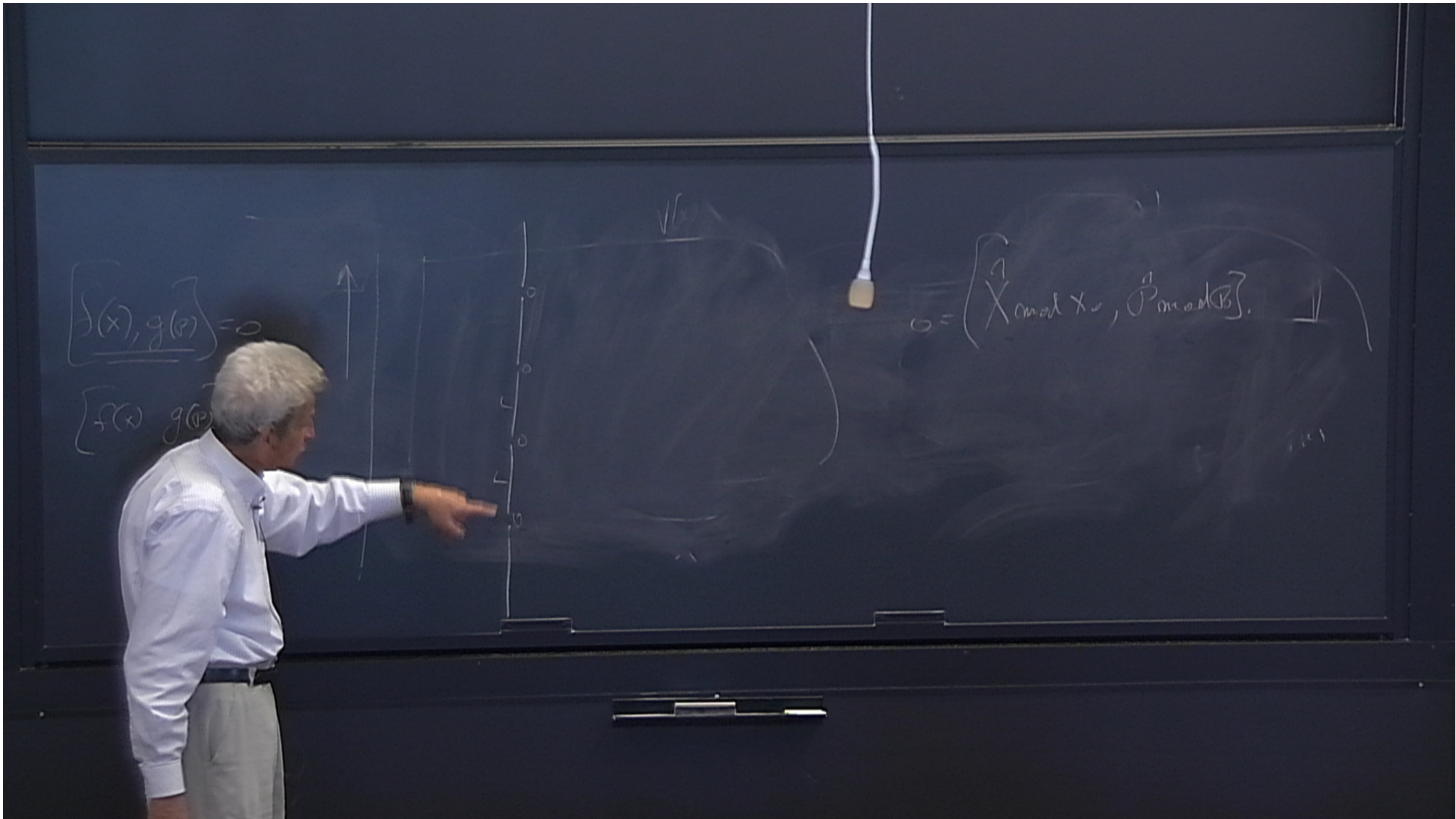




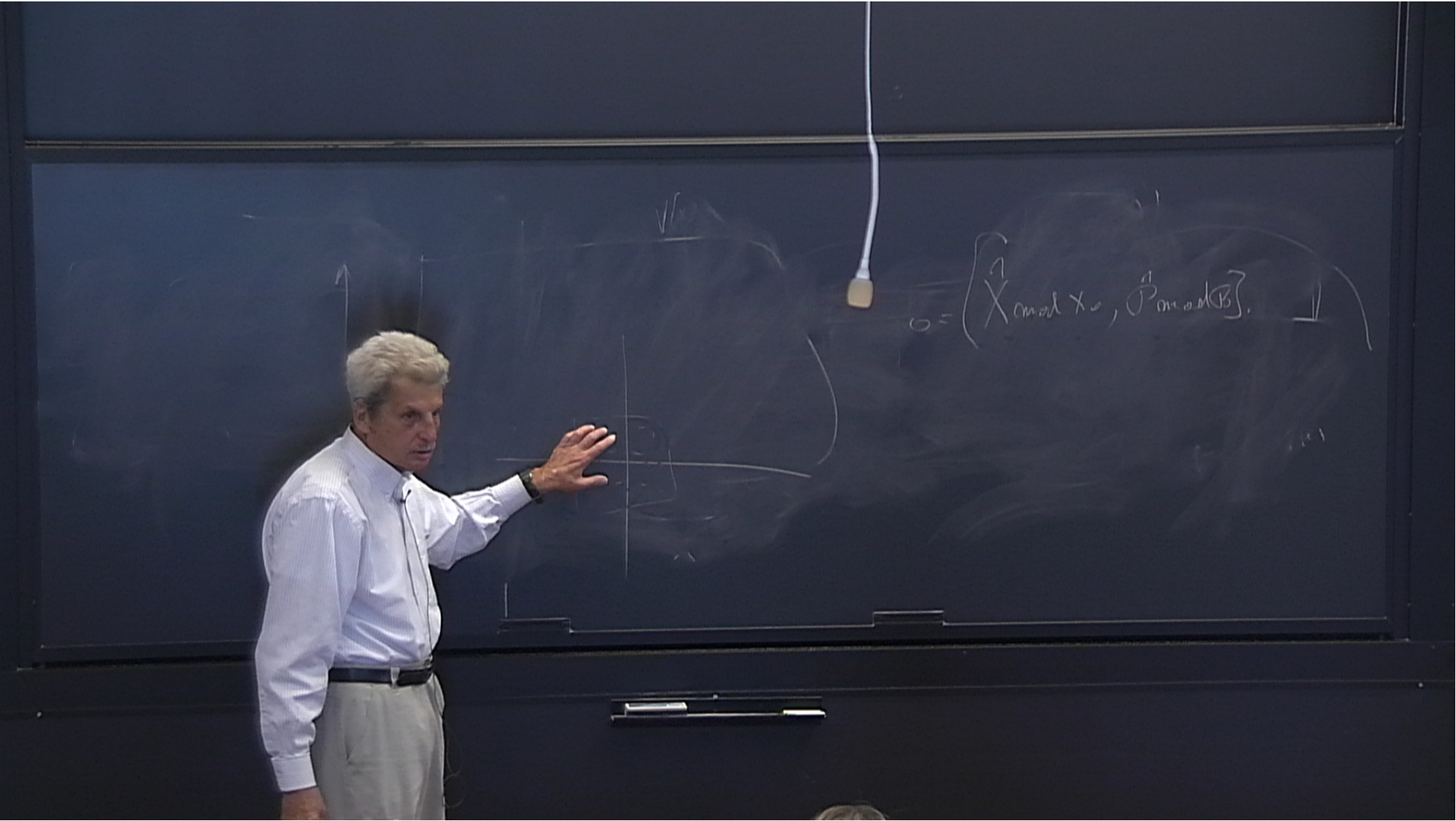




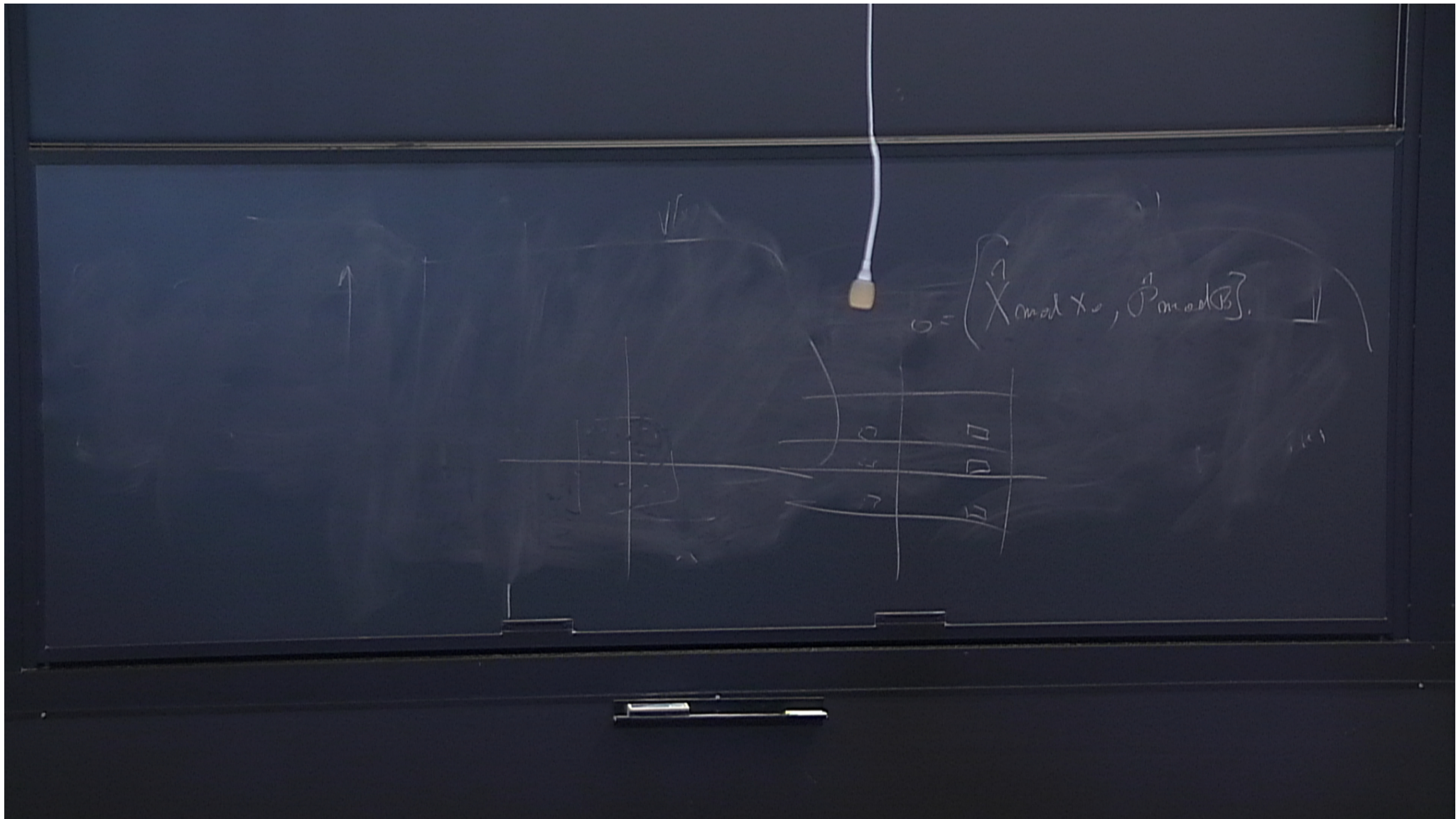




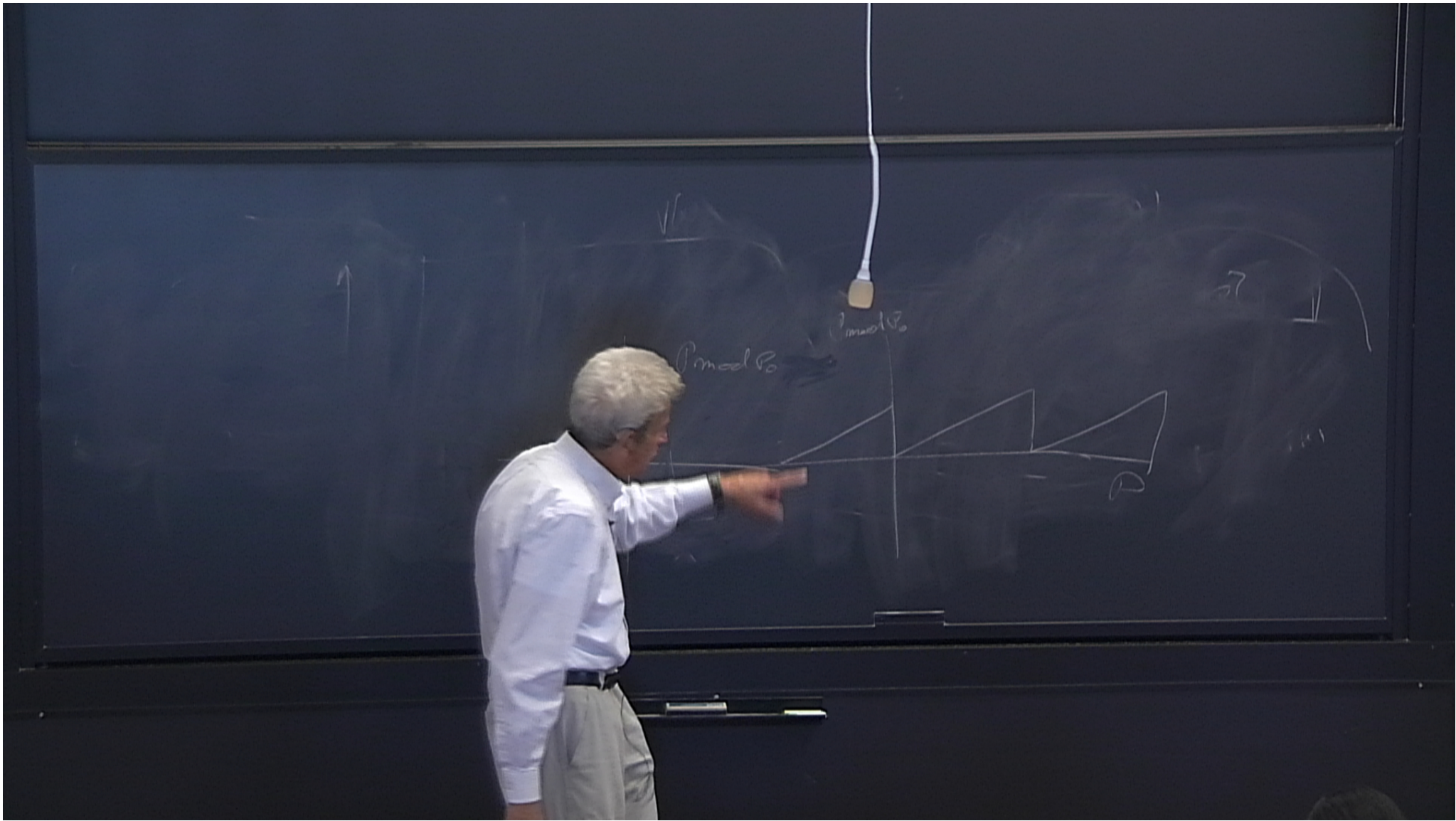




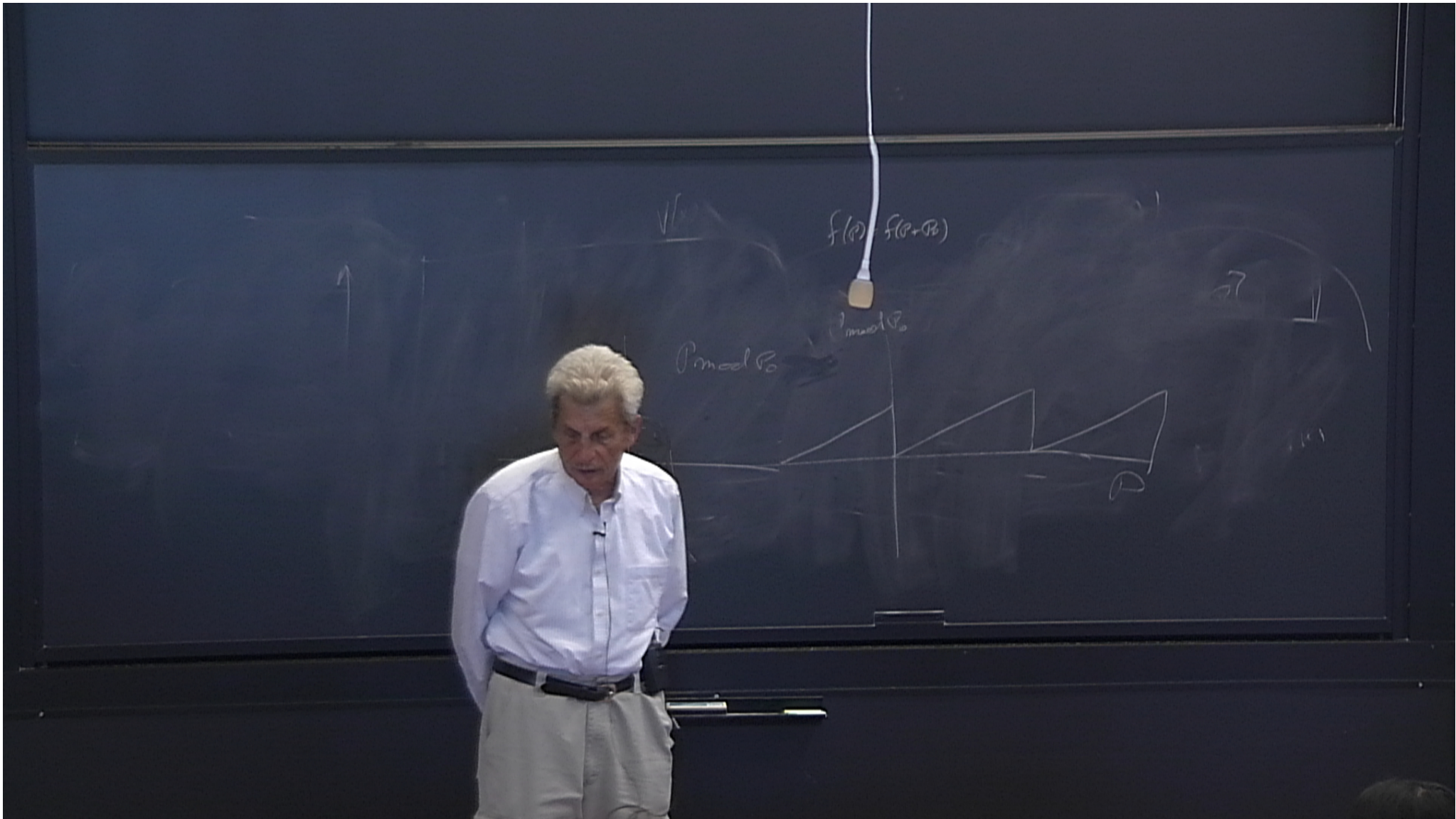




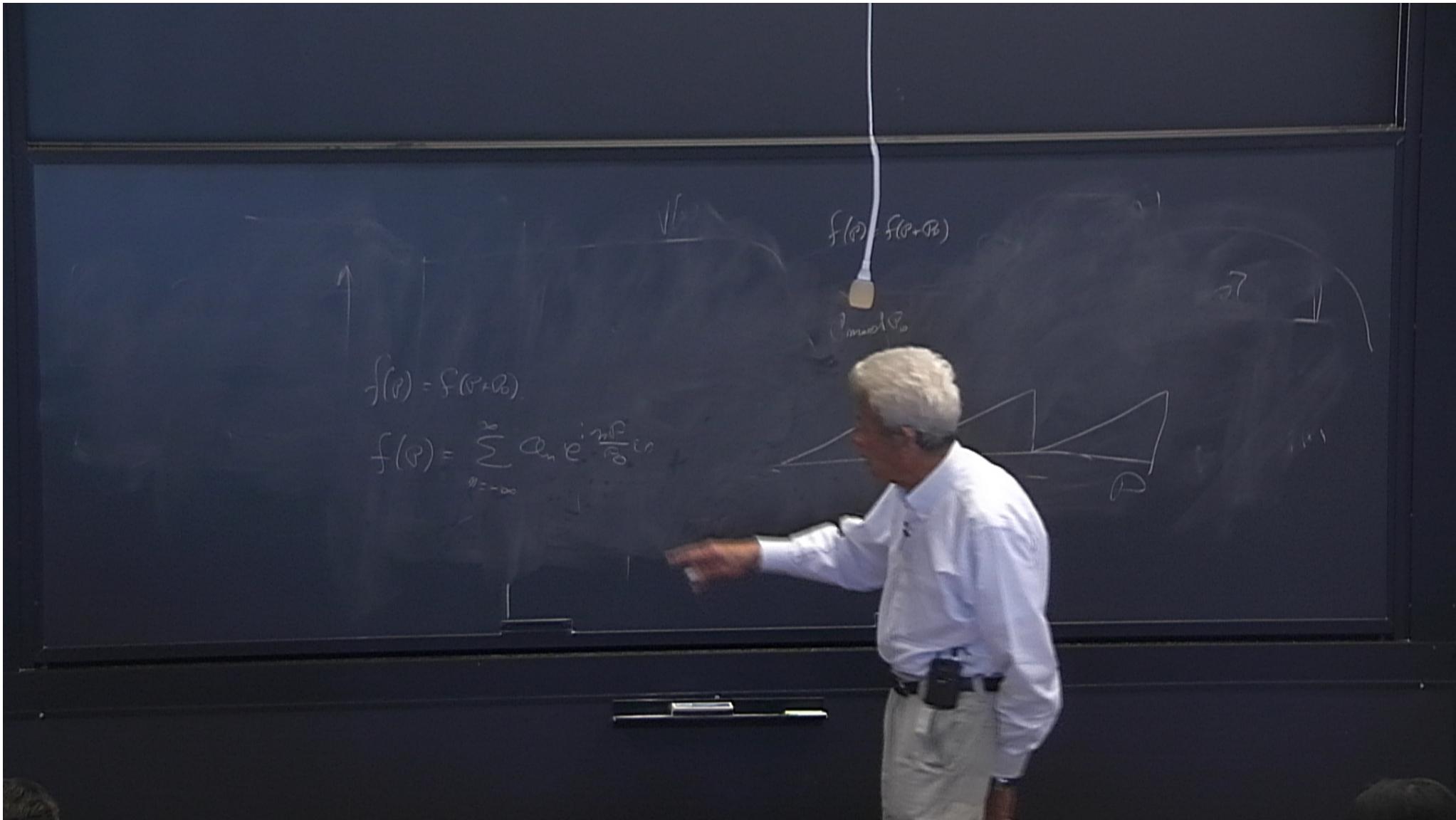




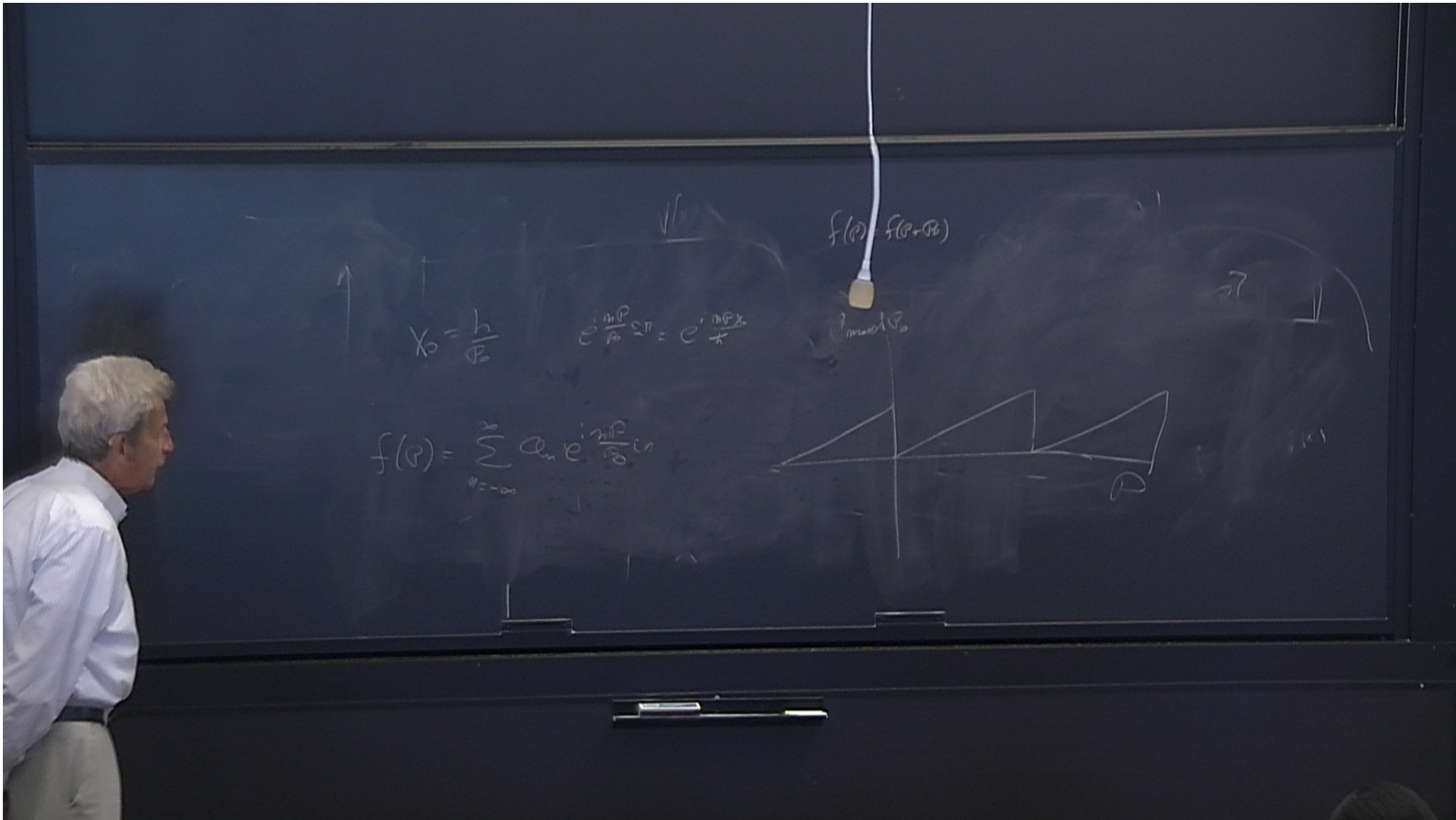














$$f(\beta) = \sum a_n e^{i \frac{n\beta x_0}{L}}$$

$$x_0 = \frac{h}{\beta_0}$$

$$e^{i \frac{n\beta}{L} x_0} = e^{i \frac{n\beta x_0}{L}}$$

$$f(\beta) = \sum_{n=-\infty}^{\infty} a_n e^{i \frac{n\beta x_0}{L}}$$

$f(\beta) f(\beta + \beta_0)$





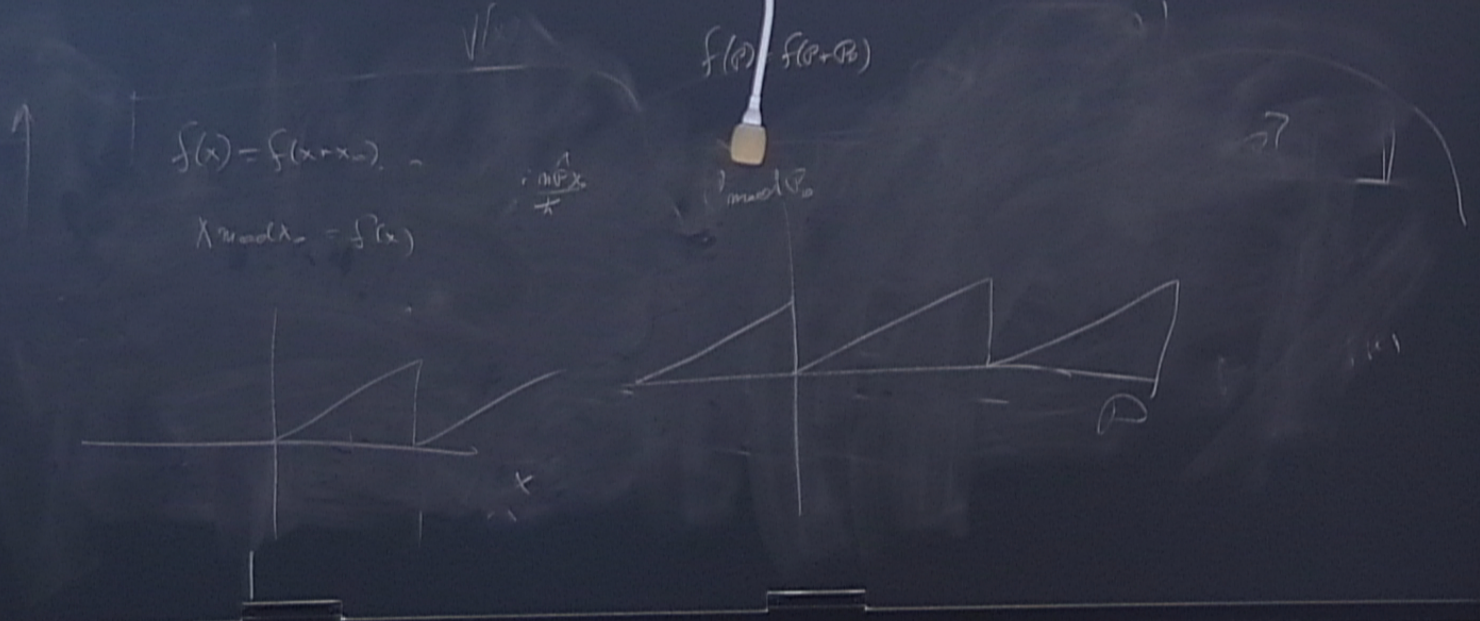
$$f(\beta) = \sum a_n e^{\frac{i n \beta x_0}{\lambda}}$$

$$f(x) = f(x+x_0)$$

$$\lambda_{\text{period}} = f(x)$$

$$\frac{i n \beta x_0}{\lambda}$$

$$f(\beta) \quad f(\beta + \beta_0)$$





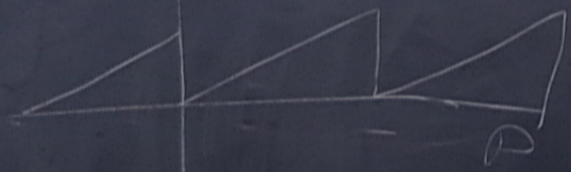
$$\vec{V} = \hat{N}_x X_0 + \hat{X}_{mod} X_0$$

$$\vec{P} = \hat{N}_p P_0 + \hat{P}_{mod} P_0$$

$\sqrt{V_0}$   
 $\frac{dV}{dt}$

$f(p)$   $f(p+P_0)$

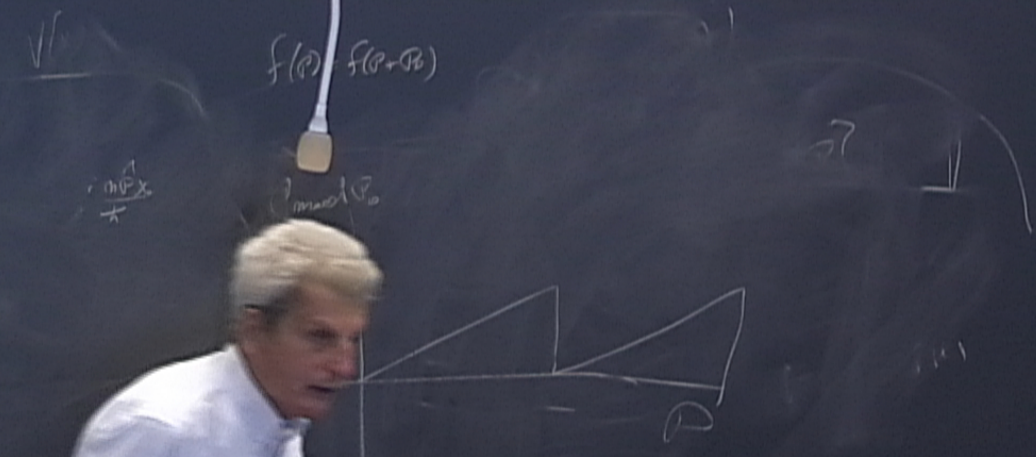
$\hat{P}_{mod} P_0$





$$\vec{X} = \hat{N}_x X_0 + \vec{X}_{mod} X_0$$

$$\vec{P} = \hat{N}_p P_0 + \vec{P}_{mod} P_0$$





$$\vec{X} = \hat{N}_x \vec{X}_0 + \vec{X}_{mod} X_0$$

$$\vec{P} = \hat{N}_p \vec{P}_0 + \vec{P}_{mod} P_0$$

$$f(p) \quad f(p+p_0)$$

$$f_{mod} P_0$$

$$\frac{dN_x}{dt}$$





$$\hat{X} = \hat{N}_x X_0 + \hat{X}_{mod} X_0$$

$$\hat{P} = \hat{N}_p P_0 + \hat{P}_{mod} P_0$$

$$f(p) f(p+p_0)$$

$$\hat{P}_x = -i\hbar \frac{\partial}{\partial x}$$



$$\hat{X} = \hat{N}_x X_0 + \int_{\text{mod}} dx$$

$$\hat{P} = \hat{N}_p P_0 + \int_{\text{mod}} dp$$

 $\sqrt{V}$ 
 $f(p) f(p+P_0)$ 
 $\frac{1}{x}$ 

$$\hat{P}_x = -i\hbar \frac{\partial}{\partial x}$$

$$|E\rangle = \int f(x) |x\rangle dx$$



$$\hat{X} = \hat{N}_x X_0 + \hat{X}_{mod} X_0$$

$$\hat{P} = \hat{N}_p P_0 + \hat{P}_{mod} P_0$$

$$\left[ \hat{P} \quad \hat{N}_x \right]$$

$$f(p) \quad f(p+p_0)$$

$$\hat{P}_x = -i\hbar \frac{\partial}{\partial x}$$

$$|E\rangle = \int f(x) |x\rangle dx$$



$$\vec{X} = \hat{N}_x X_0 + \vec{X}_{mod} X_0$$

$$\vec{P} = \hat{N}_p P_0 + \vec{P}_{mod} P_0$$

$$\left[ \hat{N}_x \vec{X}_{mod} X_0 \right]$$

$$f(p) \quad f(p+p_0)$$



$$\vec{X} = \hat{N}_x \vec{X}_0 + \vec{X}_{mod} X_0$$

$$\vec{P} = \hat{N}_p \vec{P}_0 + \vec{P}_{mod} X_0$$

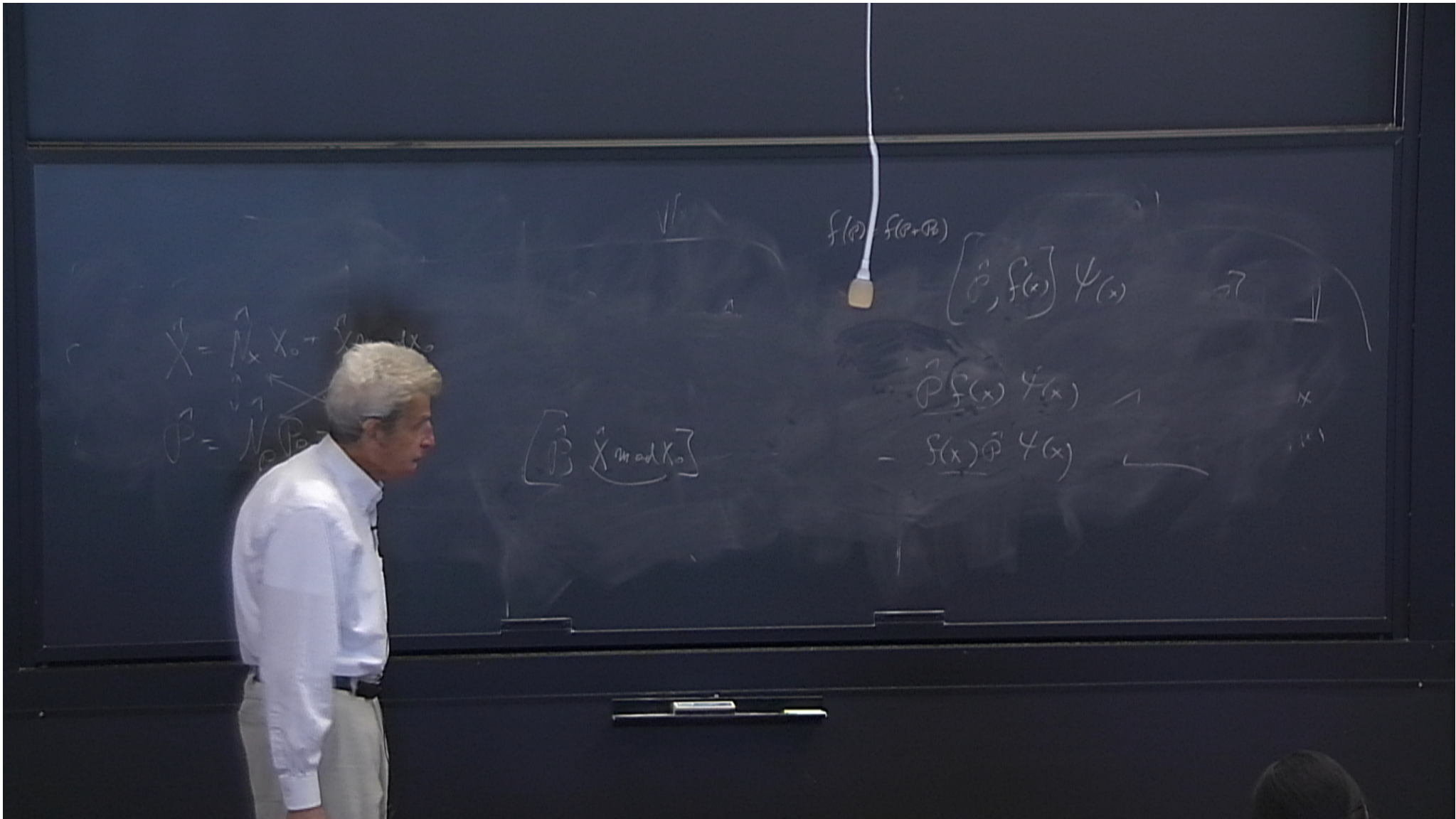
$$f(p) = f(p+p_0)$$

$$[\hat{p}, f(x)] \psi(x)$$

$$\hat{p} f(x) \psi(x)$$

$$- f(x) \hat{p} \psi(x)$$

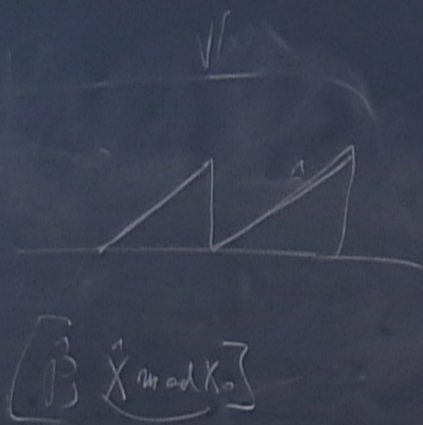






$$\hat{X} = \hat{N}_x X_0 + \hat{X}_{mod} X_0$$

$$\hat{P} = \hat{N}_p \hat{P}_0 + \hat{P}_{mod} \hat{P}_0$$



$$f(p) \quad f(p+p_0)$$

$$[\hat{p}, f(x)] \psi(x)$$

$$\hat{p} f(x) \psi(x)$$

$$- f(x) \hat{p} \psi(x)$$



$$[\hat{P}, \hat{X}_{m=0} X_0] = -i\hbar (-1 - \delta(x_m a))$$



$$[\hat{P}, \hat{X}_{m \neq 0} X_0]$$

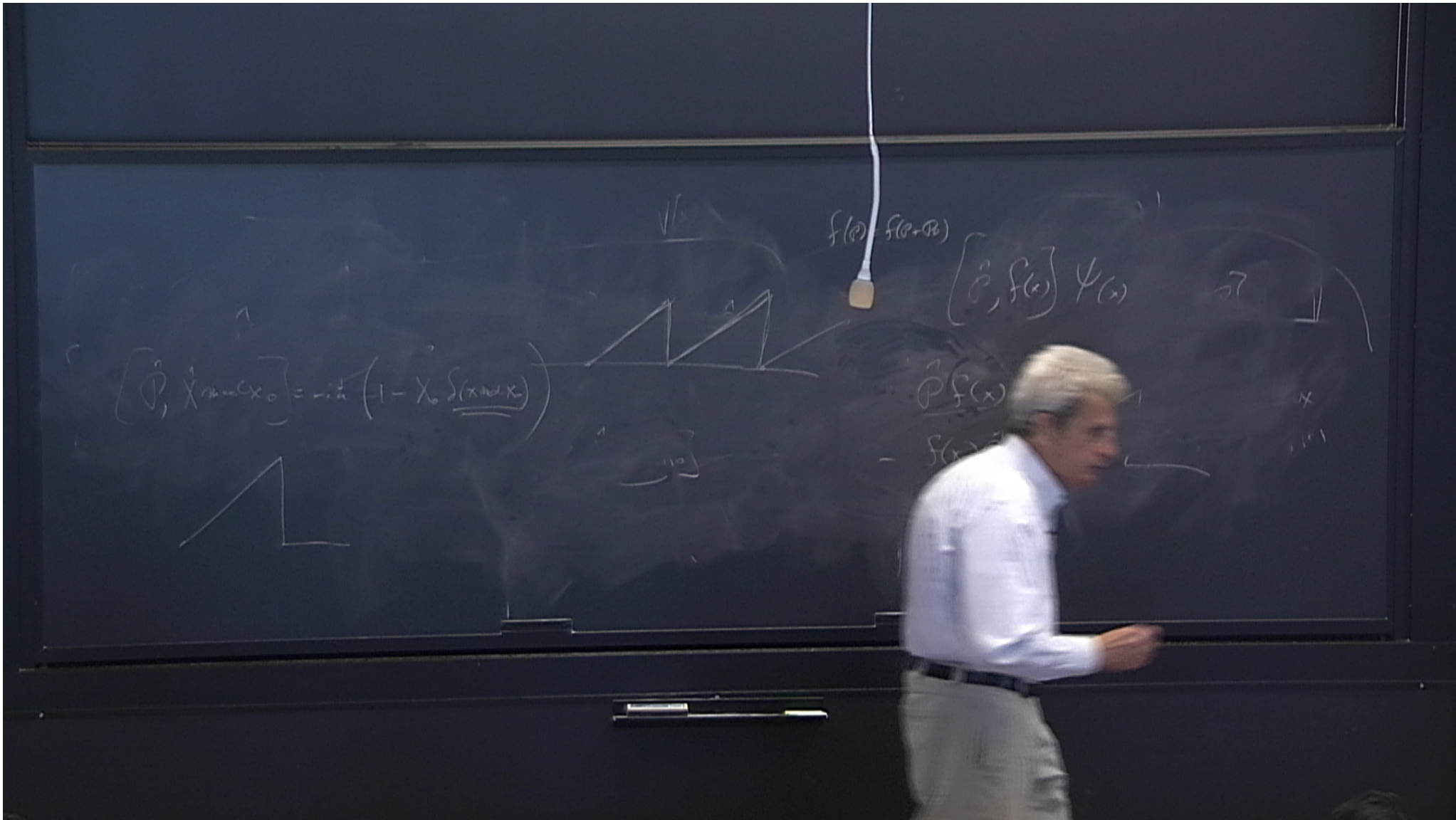
$f(p) f(p+p_0)$

$$[\hat{P}, f(x)] \psi(x)$$

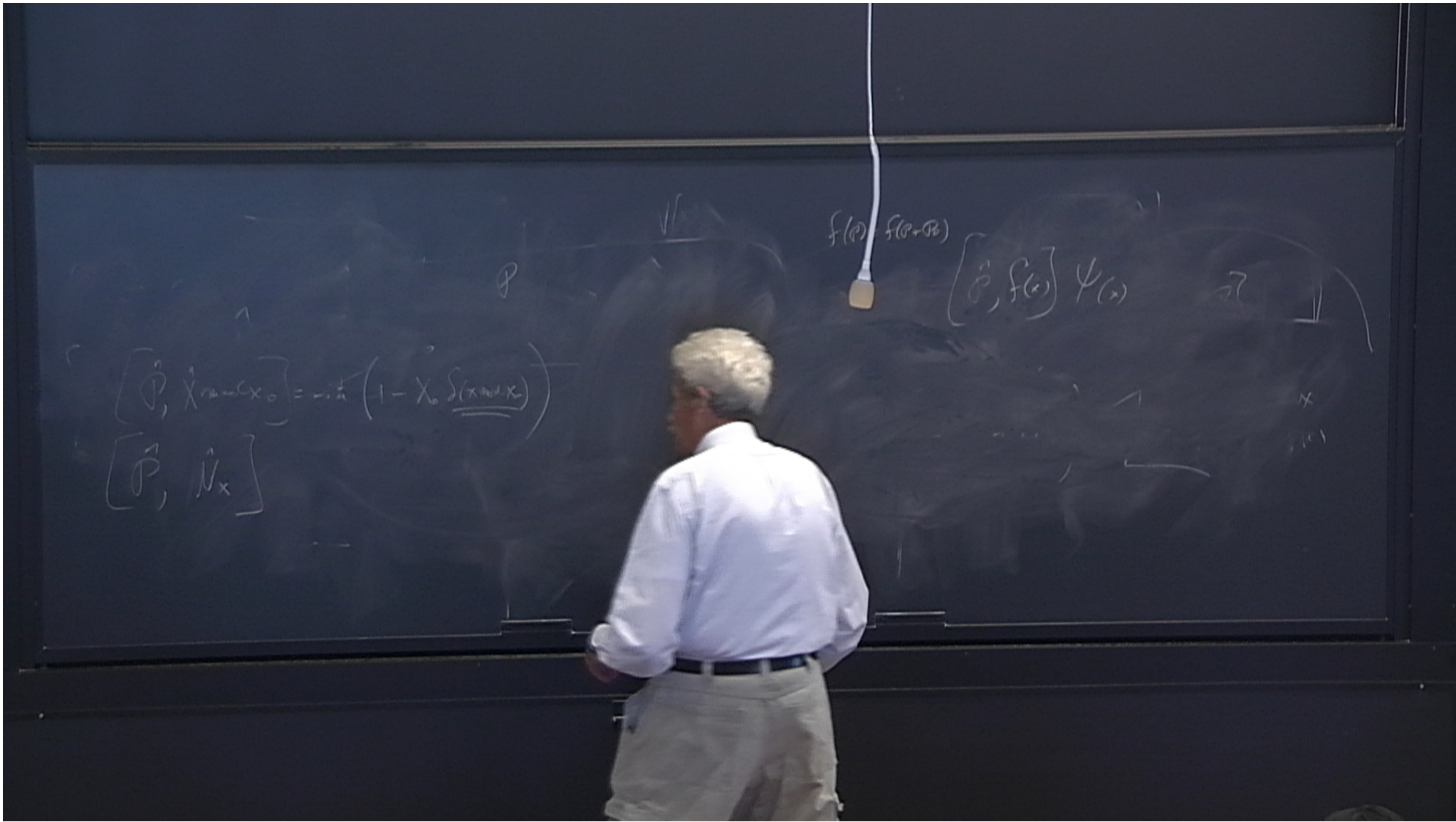
$$\hat{P} f(x) \psi(x)$$

$$f(x) \hat{P} \psi(x)$$

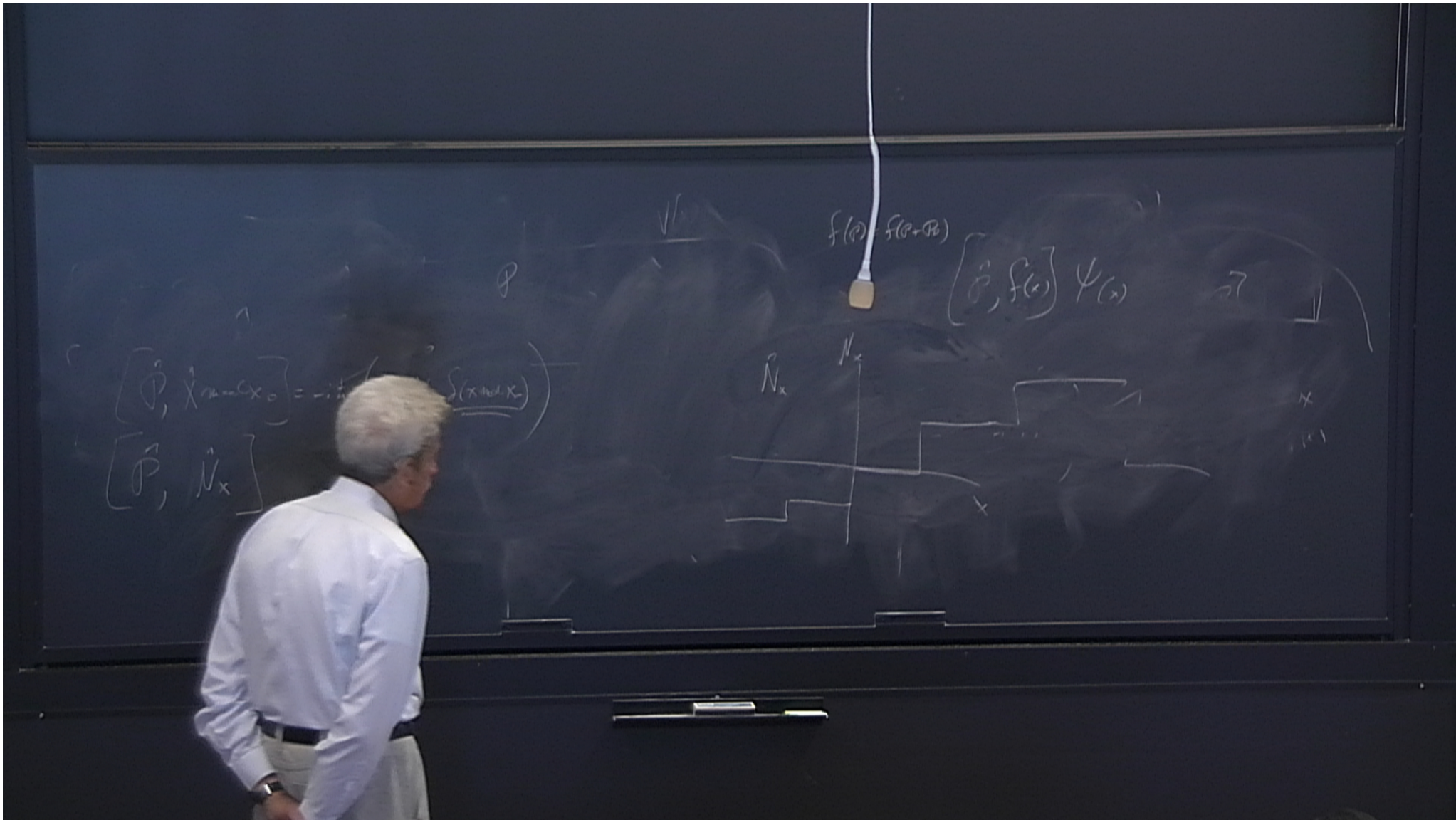




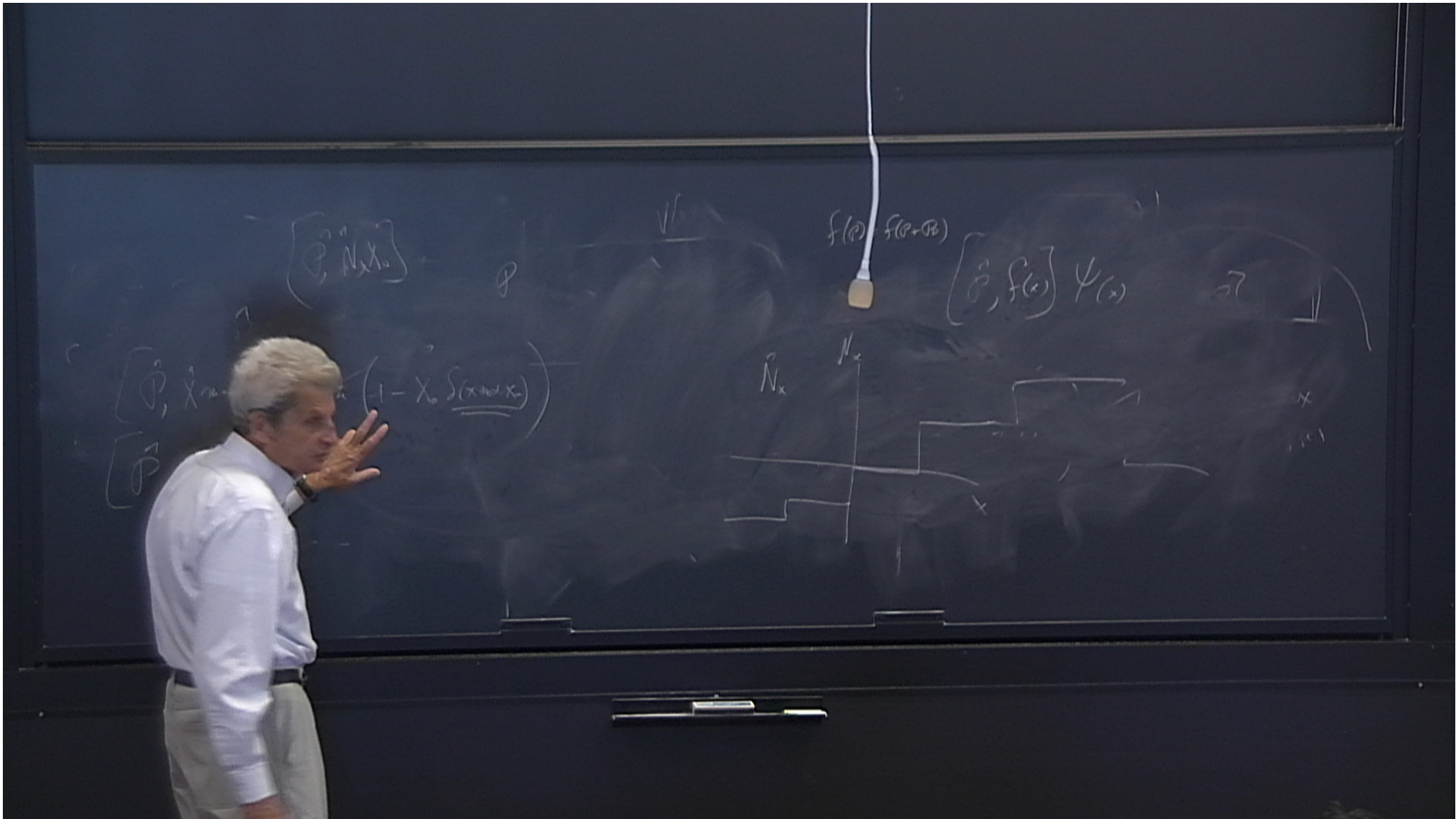














$$[\hat{p}_x, \hat{x}] = -i\hbar$$

$$[\hat{p}_x, \hat{N}_x \hat{x}] = \hat{p}_x [\hat{x}, \hat{N}_x \hat{x}] = -i\hbar \hat{p}_x$$



$$[\hat{p}_x, \hat{x}] = -i\hbar$$

$$[\hat{p}_x, \hat{N}_x X_0] + \hat{p}_x [\hat{x}, X_0] = -i\hbar$$

$$\underline{X_0 \delta(X_0)}$$

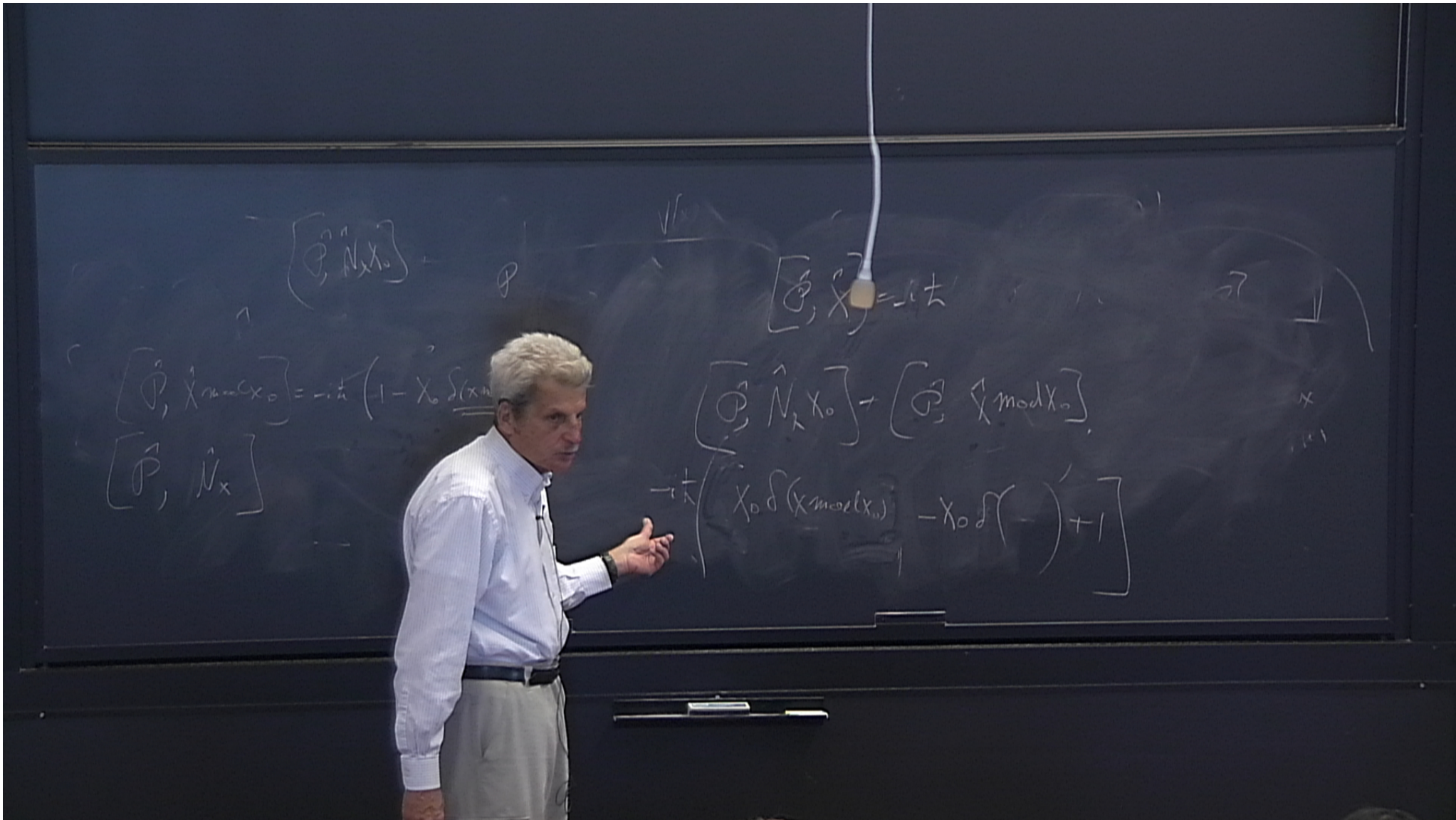


$$[\hat{p}_x, \hat{x}] = -i\hbar$$

$$[\hat{p}_x, \hat{N}_x X_0] + \hat{p}_x [\hat{x}_{mod} X_0] = -i\hbar$$

$$-i\hbar \left( \frac{X_0 \delta(x_{mod} X_0)}{X_0} \right)$$



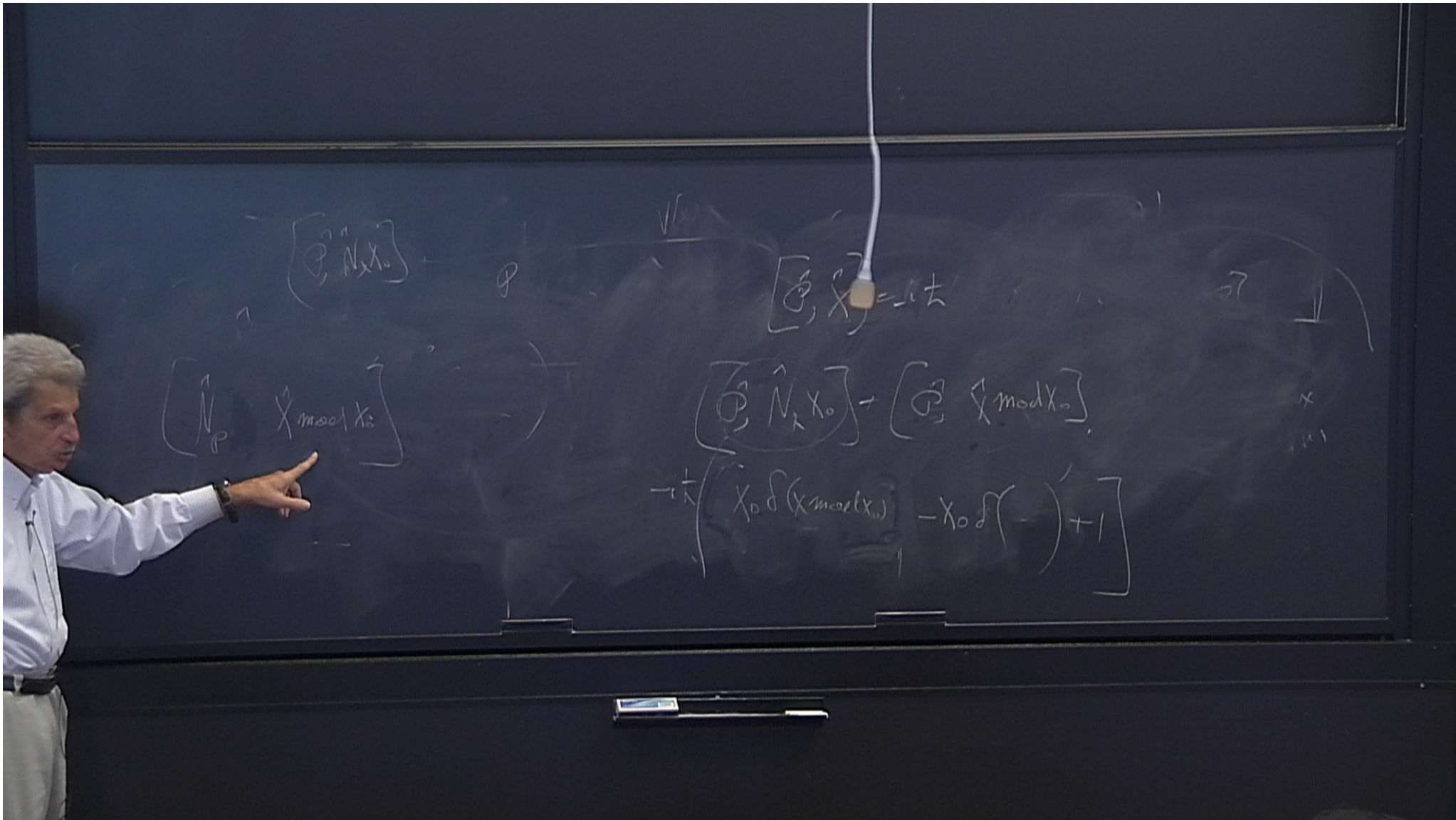


$$\begin{aligned}
 & \left[ \hat{P}, \hat{N}_x \right] = \hat{P} \\
 & \left[ \hat{P}, \hat{X}_{n=0} \right] = -i\hbar \left( 1 - X_0 \delta(x) \right) \\
 & \left[ \hat{P}, \hat{N}_x \right] \\
 & \left[ \hat{P}, \hat{X} \right] = -i\hbar \\
 & \left[ \hat{P}, \hat{N}_x X_0 \right] = \left[ \hat{P}, \hat{X} \text{ mod } X_0 \right] \\
 & -i\hbar \left( X_0 \delta(x \text{ mod } X_0) - X_0 \delta(-) + 1 \right)
 \end{aligned}$$

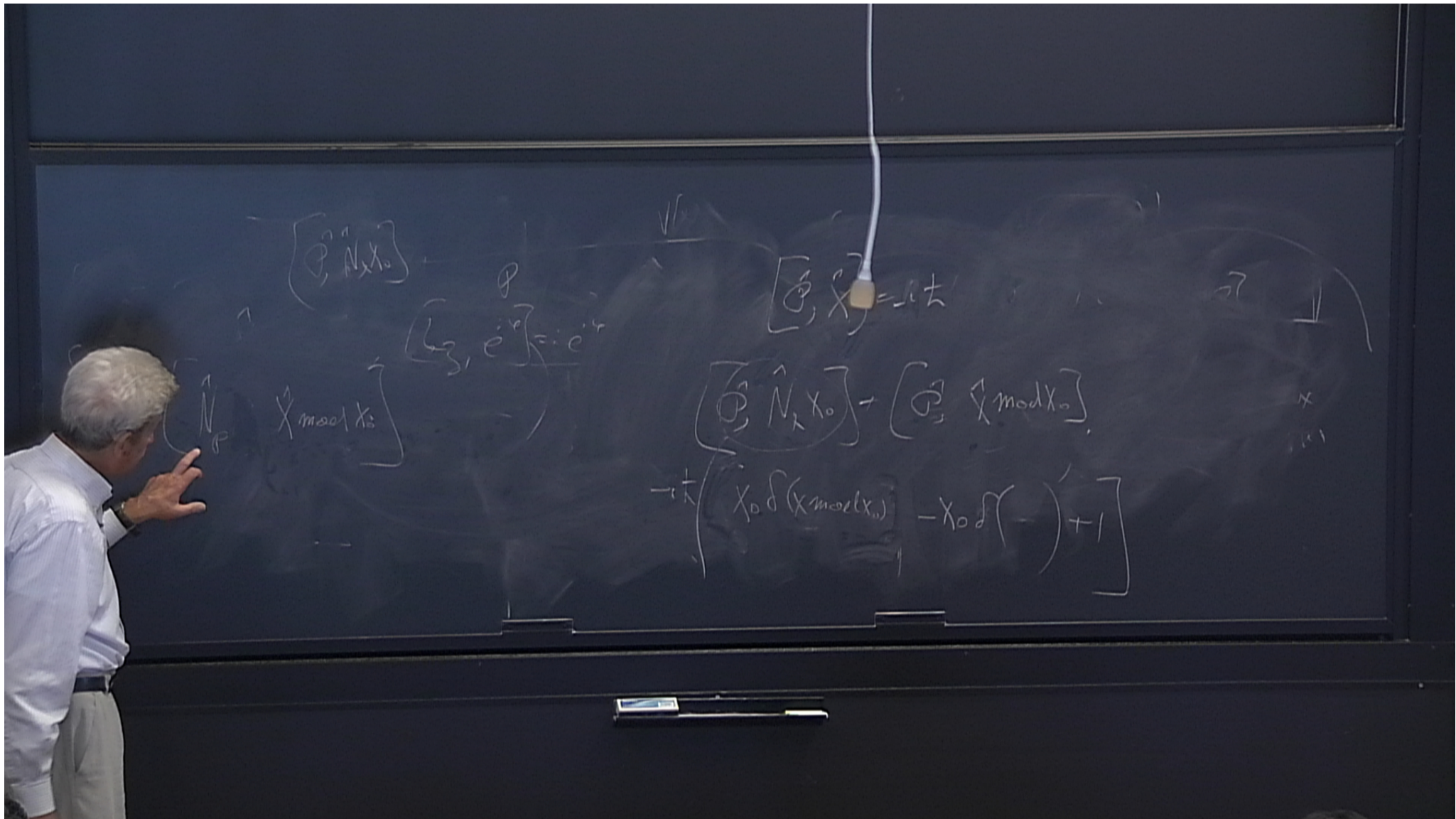


$$\begin{array}{ccc}
 \begin{array}{c} \uparrow \\ \left[ \hat{P}, \hat{N}x_0 \right] \\ \uparrow \\ \left[ \hat{N}_p \hat{P}_0, X_{\text{mod} X_0} \right] \end{array} & \xrightarrow{\varphi} & \begin{array}{c} \downarrow \\ \left[ \hat{P}, \hat{X} \right] = \text{it} \\ \downarrow \\ \left[ \hat{P}, \hat{N}_x x_0 \right] + \left[ \hat{P}, X_{\text{mod} X_0} \right] \\ \downarrow \\ \text{it} \left( \begin{array}{c} X_0 d(X_{\text{mod} X_0}) \\ - X_0 d(-) + 1 \end{array} \right) \end{array}
 \end{array}$$

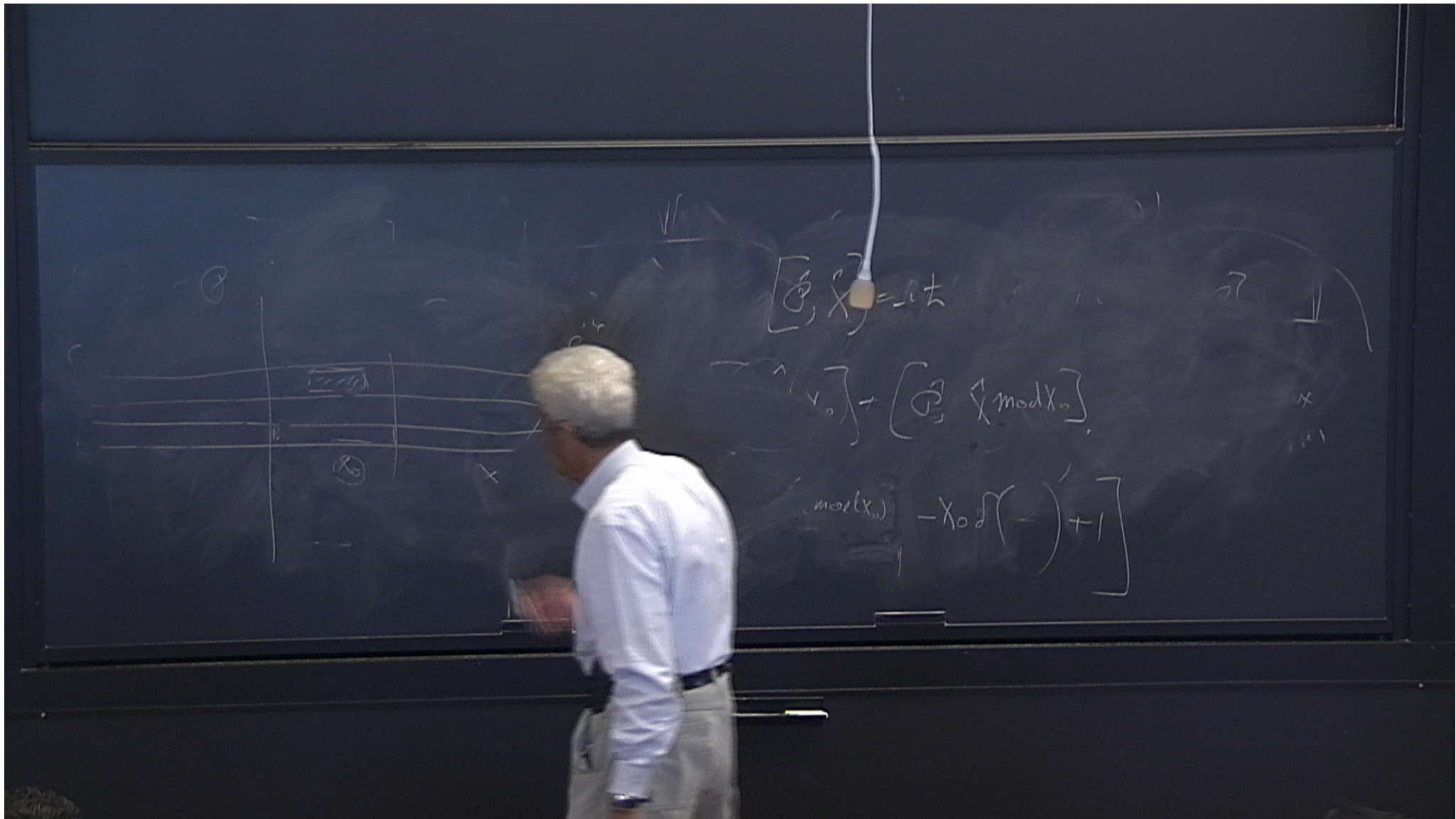




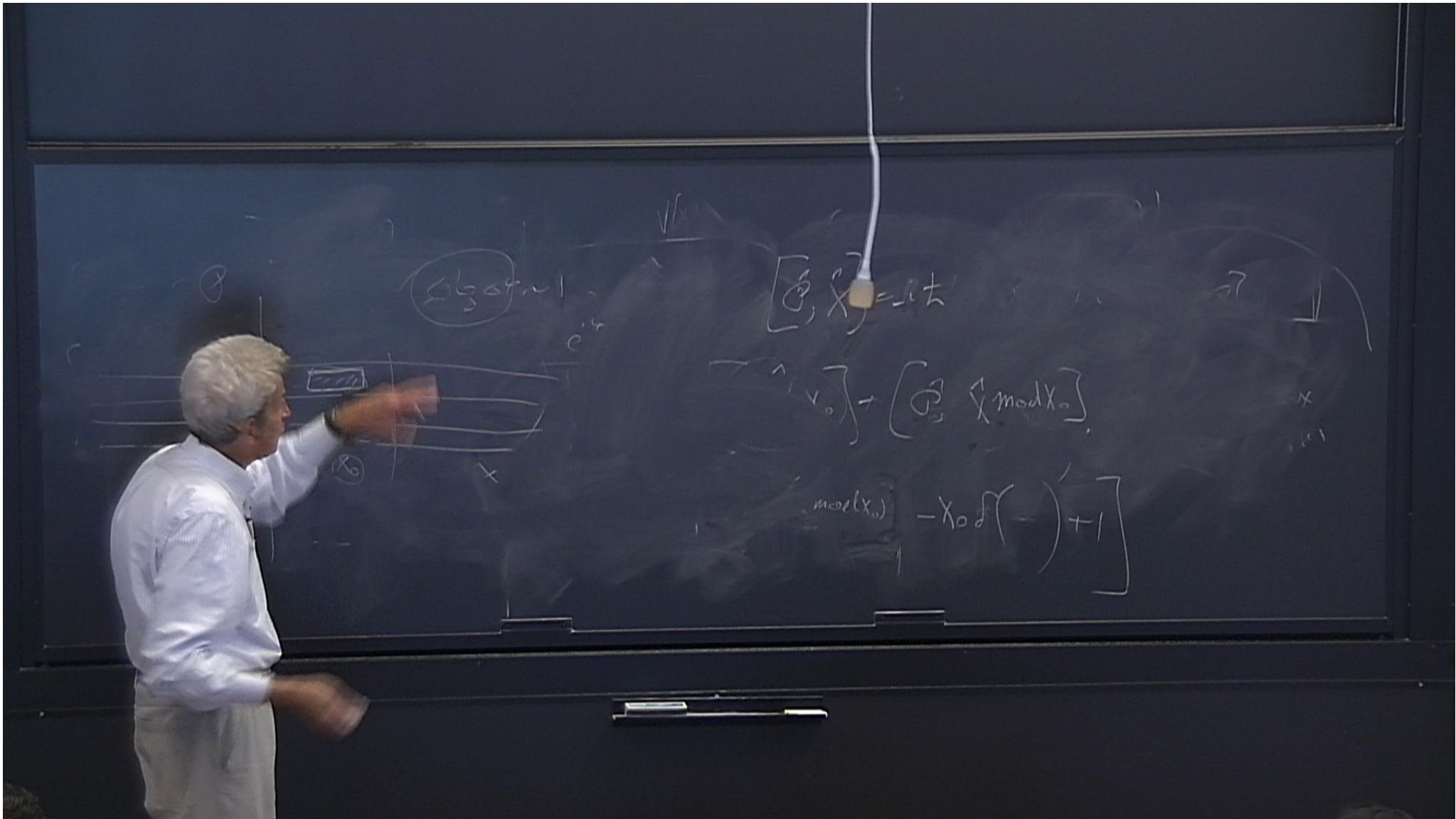




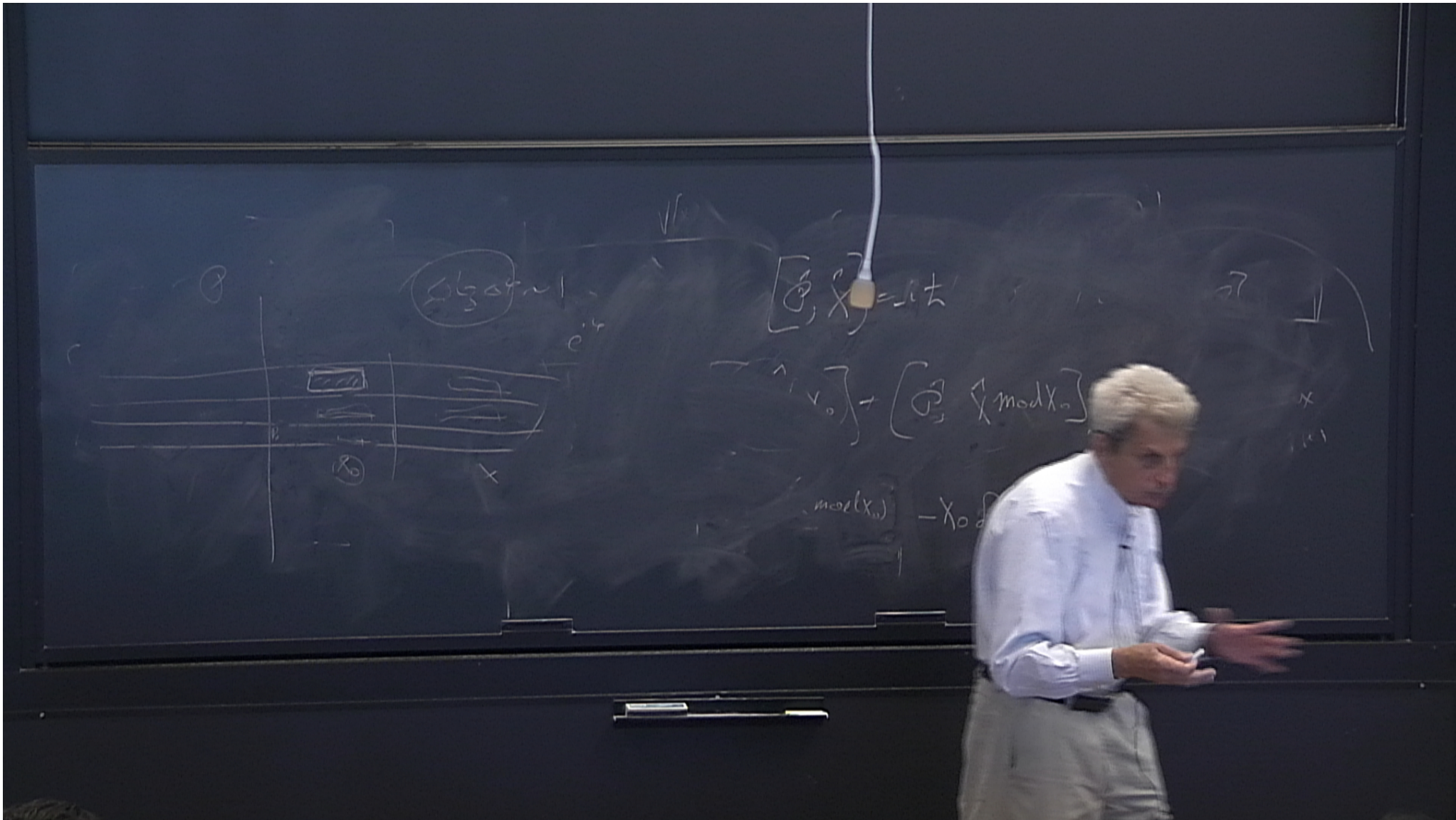




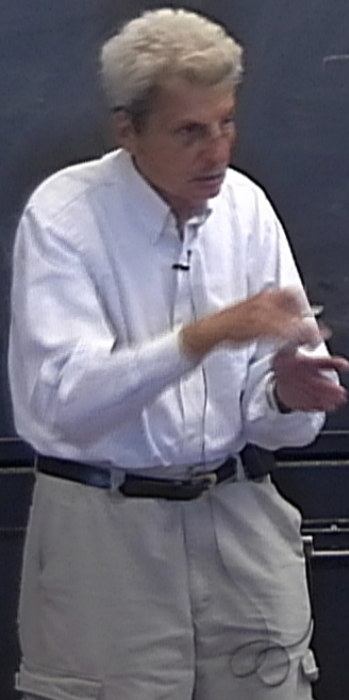












$$[\mathbb{Q}, X] = \mathbb{Z} \oplus \mathbb{Z} \oplus \mathbb{Z}$$

$$[\mathbb{Q}, X] \rightarrow [\mathbb{Q}, X \bmod X_0]$$

$$\bmod(X_0) = X_0 d \left( \frac{\cdot}{\cdot} \right) + 1$$





$$\frac{P_0}{2\pi r^2}$$

$\sqrt{r}$

$$[\mathbb{Q}, \sqrt{x}] = \mathbb{Q}(\sqrt{x})$$

$$[\mathbb{Q}(\sqrt{x_0})] + [\mathbb{Q}(\sqrt{x} \bmod x_0)]$$

$$[\mathbb{Q}(\sqrt{x_0})] - x_0 d \left( \frac{\cdot}{\cdot} \right) + 1$$





$$H = \frac{(P_0 - \frac{1}{2} A_0)^2}{2mr^2}$$

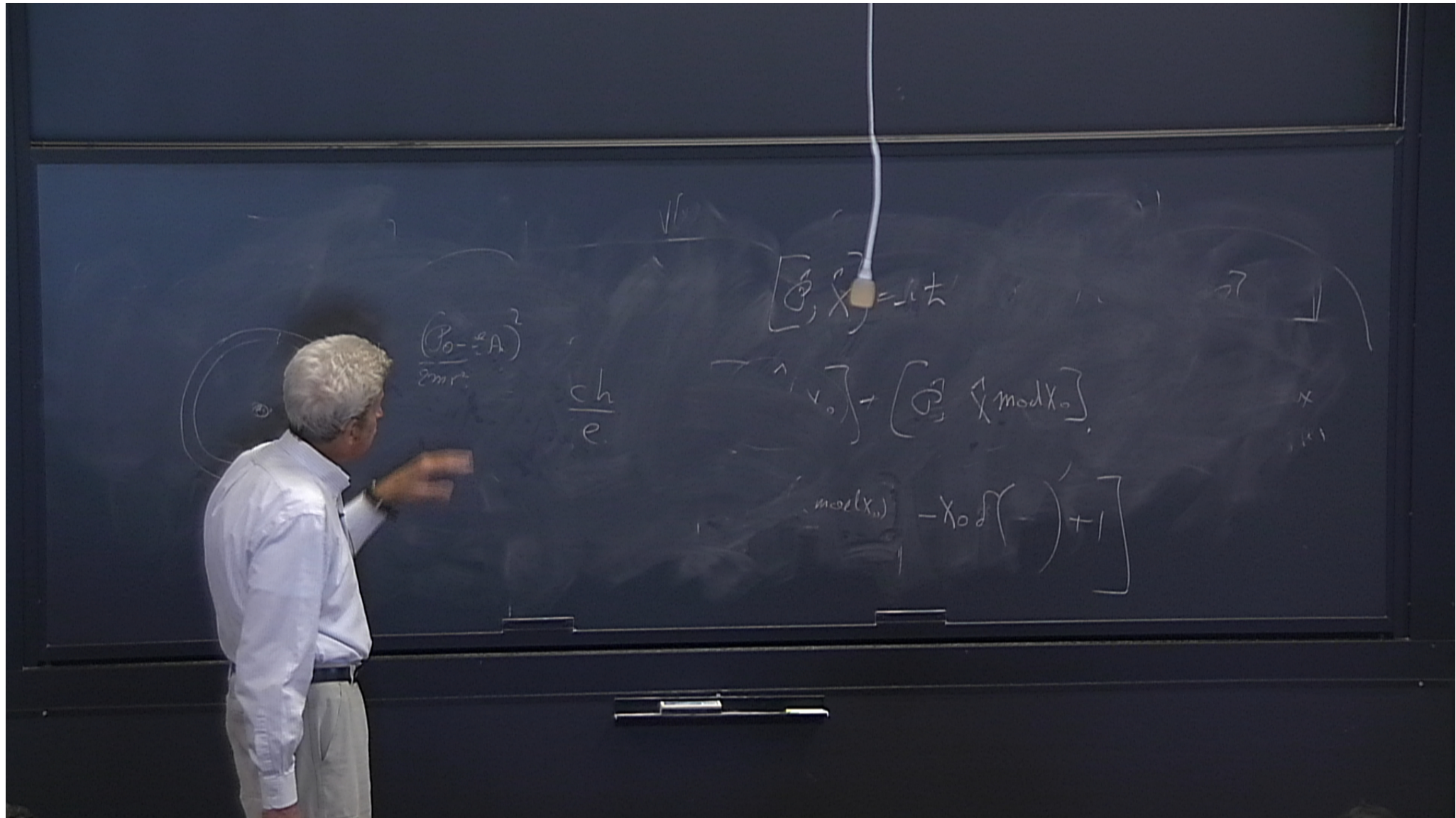
$\sqrt{h}$

$$[\mathcal{O}, X] = -it$$

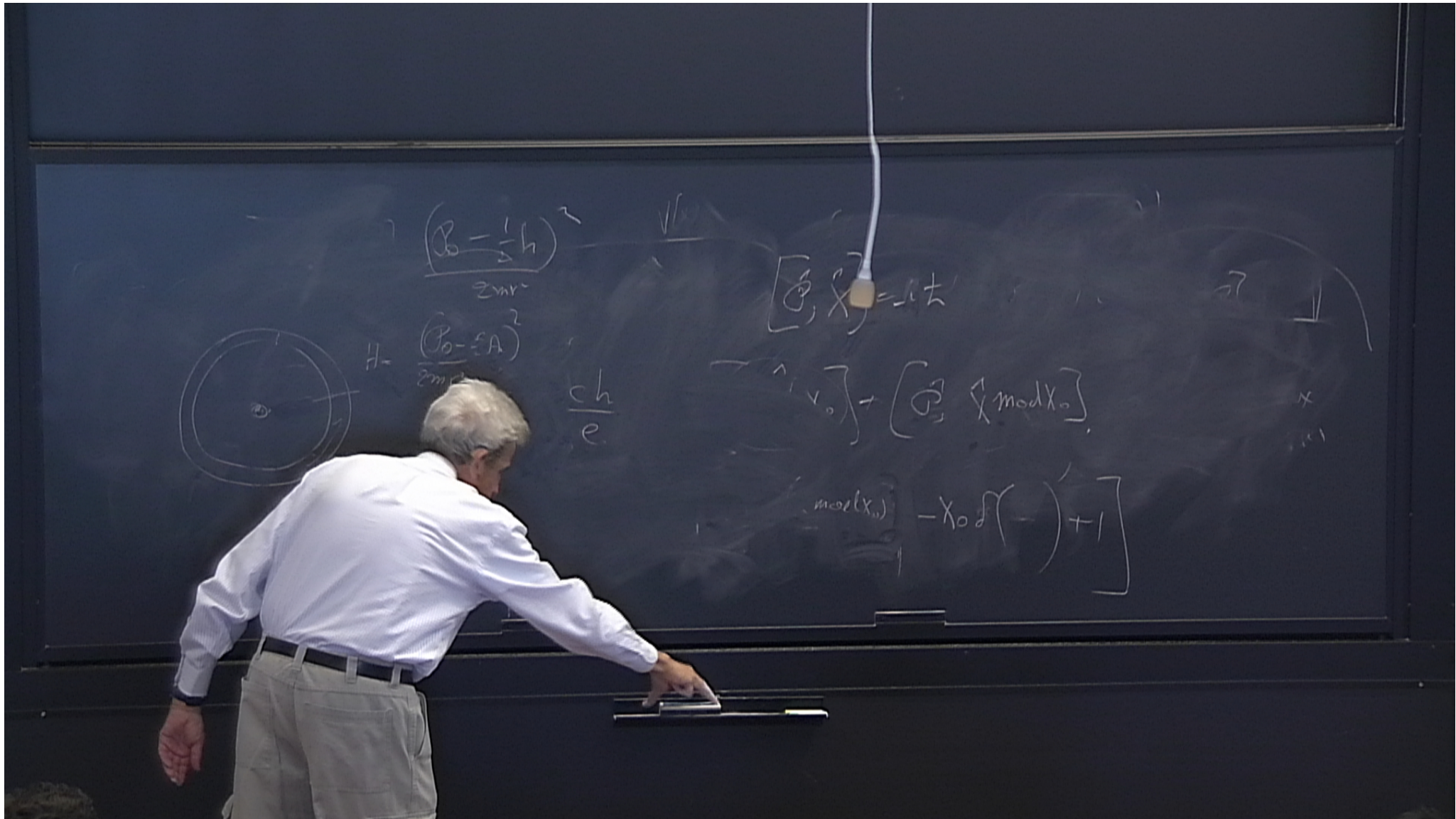
$$[v_0] + [\mathcal{O}, X \bmod X_0]$$

$$\bmod(X_0) = X_0 d(-) + 1$$

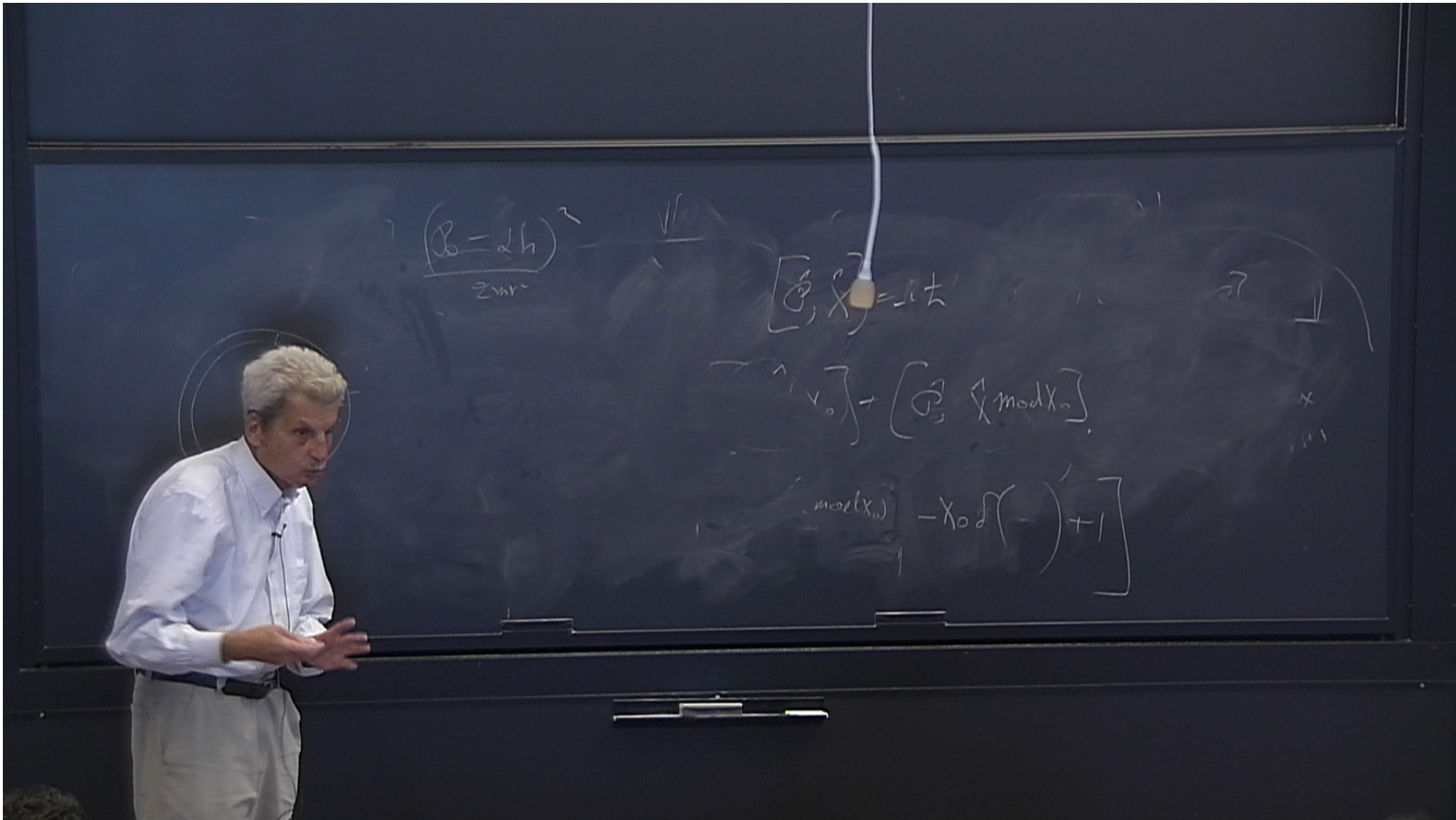












$$\frac{(\beta - \alpha h)}{2mr}$$

$\sqrt{h}$

$$[\beta, \alpha] = -it$$

$$[\alpha, \beta] + [\beta, \alpha \pmod{X_0}]$$

$$\pmod{X_0} - X_0 d \left( \frac{\cdot}{\cdot} \right) + 1$$



