Ex 8483 Millikan

$$m\dot{v} = -\eta v + f(t) + (e\xi - mg)$$

$$D = \frac{1}{\eta}T \quad , \quad \langle v \rangle = \frac{1}{\eta}\delta F$$

$$D \cdot t \ll L^2 \Rightarrow \underline{t_d = \eta L^2 / T}$$

$$v t_d > L \Rightarrow \underline{\delta F > T/L}$$

$$\langle v(t) v(0) \rangle = \frac{T}{m} e^{-\gamma |t|} \qquad \gamma \equiv \eta/m$$

$$I = \frac{N}{L} e v \quad , \quad \langle I \rangle = \frac{N}{L} e \frac{1}{\eta} \delta F$$

$$\tilde{C}(\omega) = N \frac{e^2}{L^2} \frac{T}{m} \frac{2\gamma}{\omega^2 + \gamma^2}$$

$$Q \equiv \int I(t) dt$$

$$\Delta Q \ll \langle Q \rangle \Rightarrow \sqrt{\tilde{C}(0) \cdot t} \ll \langle I \rangle \cdot t$$

$$\Rightarrow \underline{\frac{\eta T}{N} \ll \delta F^2 \cdot t}$$

$$\frac{\delta F^{(N)}}{\delta F^{(1)}} = \frac{1}{\sqrt{N \cdot (t/t_d)}}$$