let $\langle x^2 \rangle_{AVG} = y$

$$\frac{dy}{dt} = 2ky + k\bar{n}$$

$$\left(\frac{d}{dt} \langle n^2 \rangle_{AV} = 2k \langle n^2 \rangle_{AV} + k\bar{n} \right)$$

$$\frac{dy}{dt} + p(t)y = g(t)$$

$$p(t) = -2k$$

$$g(t) = k\bar{n}$$

$$y(t) = \frac{\int \mu(t) g(t) \cdot dt + B}{\mu(t)}$$ → constant

$$\mu(t) = e^{\int p(t)dt + C} = A \cdot e^{\int -2k \cdot dt} = A \cdot e^{-2kt}$$

$$y(t) = \frac{\int A \cdot e^{-2kt} \cdot k\bar{n} \cdot dt + B}{A \cdot e^{-2kt}}$$

$$\bar{n} = n_0 e^{kt}$$

$$= \frac{\int A \cdot k \cdot n_0 \cdot e^{-kt} \cdot dt + B}{A \times e^{-2kt}}$$

$$= \frac{-An_0 e^{-kt} + B}{A \times e^{-2kt}}$$

$$= -n_0 e^{kt} + \frac{B}{A} \times e^{2kt}$$

$$= A' e^{2kt} - n_0 e^{kt}$$