[nex72] Structure function of harmonic oscillator II.

Consider the classical harmonic oscillator,

$$H = \frac{p^2}{2m} + \frac{1}{2}m\omega_0^2 q^2.$$

Use the recursion method with inner product $\langle A|B \rangle = \langle AB \rangle$ to calculate the structure function $S_{qq}(\omega)$ for the position variable at temperature T, where $\langle p^2 \rangle/2m = \frac{1}{2}m\omega_0^2\langle q^2 \rangle = \frac{1}{2}k_B T$, according to the equipartition theorem.

Solution: