[nex66] **Linear response of classical relaxator.**

The classical relaxator is defined by the equation of motion

$$\dot{x} + \frac{1}{\tau_0} x = a(t),$$

where τ_0 is the relaxation time and $a(t)$ a weak periodic perturbation. The (linear) response function is defined by the relation $x(t) = \int_{-\infty}^{\infty} dt' \tilde{\chi}_{xx}(t-t')a(t')$.

(a) Calculate the generalized susceptibility $\chi_{xx}(\omega)$ as well as its reactive part $\chi'_{xx}(\omega)$ and its dissipative part $\chi''_{xx}(\omega)$. (b) Use the (classical) fluctuation-dissipation theorem to infer the spectral density $\Phi_{xx}(\omega)$ from the dissipation function $\chi''_{xx}(\omega)$. (c) Plot the functions $\chi'_{xx}(\omega), \chi''_{xx}(\omega)$, and $\Phi_{xx}(\omega)$ versus ω for $\tau_0 = 1$.