[nex60] **Brownian harmonic oscillator III.**

Use the formal solution

$$\begin{aligned} v(t) &= v_0 e^{-\Gamma t} c(t) - \frac{\omega_0^2}{\Omega_1} x_0 e^{-\Gamma t} \sinh \Omega_1 t \\ &+ \frac{1}{m} \int_0^t dt' f(t') e^{-\Gamma(t-t')} c(t-t') \end{aligned}$$

$\Gamma = \gamma/2m$, $\Omega_1 = \sqrt{\Gamma^2 - \omega_0^2}$, $c(t) = \cosh \Omega_1 t - (\Gamma/\Omega_1) \sinh \Omega_1 t$ of the Langevin-type equation $m(dv/dt) = -\gamma v - m\omega_0^2 x + f(t)$ for the Brownian harmonic oscillator to calculate the velocity autocorrelation function $\langle v(t_2) v(t_1) \rangle$ at stationarity (i.e. for $t_1, t_2 \to \infty$ with $0 < t_2 - t_1 < \infty$) under the assumption that the random force is white noise with intensity $I_w = 2k_B T \gamma$.