[mex182] Driven harmonic oscillator: power input

Consider the driven harmonic oscillator, $m\ddot{x} = -kx - \gamma\dot{x} + F_0 \cos\omega t$, in a steady-state motion. (a) Calculate the average power input, $\langle P(\omega)\rangle \doteq \langle F_0 \cos\omega t \cdot \dot{x}(t)\rangle$. Use the parameters $\beta \doteq \gamma/2m$, $\omega_0 \doteq \sqrt{k/m}$, $A \doteq F_0/m$. (b) Find the resonant frequency ω_P and the maximum (averaged) power input $P_{max} = \langle P(\omega_P)\rangle$.

Solution: