

Oscillations: Forced Systems & Index of Refraction (Reading: Chapter 5.5 - 5.6)

Help:

i Energy loss in a damped-driven oscillator. The problem set is light this week so that you have more time to prepare for and take the midterm.

Consider a damped oscillator, with natural frequency ω_0 and damping constant β both fixed, that is driven by a force $F(t) = F_0 \cos(\omega t)$.

- (a) Find the rate of $P(t)$ at which $F(t)$ does work and show that the average rate $\langle P \rangle$ over any number of complete cycles is $m\beta\omega^2 A^2$.
- (b) Verify that this is the same as the average rate at which energy is lost to the resistive force.
- (c) Show that as ω is varied $\langle P \rangle$ is maximum when $\omega = \omega_0$; that is, the resonance of the power occurs at $\omega = \omega_0$ (exactly).

