PHYS 214 FALL 2001

PROBLEM SET #3:
(Solutions)

① PROBLEM #1:

In lectures we showed that the solution to the E. of M. for a driven/damped H.O. is of the form

$$x(t) = x_{eq.} + Re\left[\underline{A}\, e^{i\omega t}\right], \qquad (1)$$

provided that the complex amplitude $\underline{A}$ has the form:

$$\underline{A} = A e^{i\phi} = \frac{f}{\omega_o^2 - \omega^2 + i b\omega} \Longrightarrow$$

$$A \equiv |\underline{A}| = \frac{f}{\sqrt{(\omega_o^2 - \omega^2)^2 + (b\omega)^2}}, \quad \phi = \tan^{-1}\left[\frac{b\omega}{\omega^2 - \omega_o^2}\right]$$

where $\omega_o \equiv \sqrt{\frac{k}{m}}$ is the natural frequency of the system, ω is the frequency of the driving force ($F(t) = F_o \cos(\omega t)$), and $f \equiv F_o/m$.

In various limits we find for $(A/f)(\omega)$: