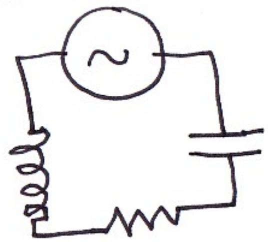
## Driven Electrical Oscillator

$$V_{drive} = V_0 \cos \omega_d t$$



Kirchoff's loop rule ⇒

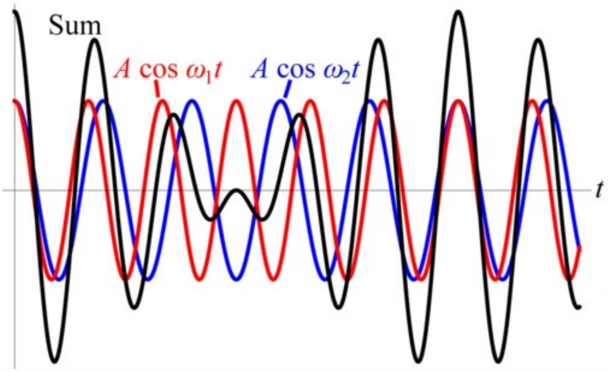
$$V_L + V_R + V_C = V_0 \cos \omega_d t$$

$$L\ddot{q} + R\dot{q} + \frac{1}{C} q = V_0 \cos \omega_d t$$

$$\updownarrow$$

$$m\ddot{x} + b\dot{x} + kx = F_0 \cos \omega_d t$$

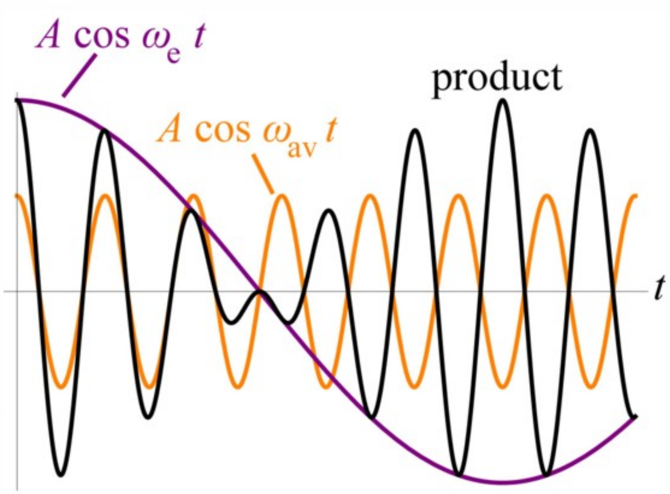
* ⇒ The amplitude $V_0$ of the drive voltage is isomorphic to the amplitude $F_0$ of the drive Force. *



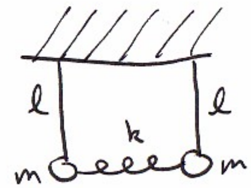

$\rightarrow$ $$f_{beat} = \frac{1}{T_{beat}} = f_1 - f_2$$

Book $\rightarrow$ $$z_{TOT} = Ae^{i\omega_1 t} + Ae^{i\omega_2 t} = 2A \cos\omega_e t \, e^{i\omega_{av} t}$$

where $\omega_{av} = \frac{\omega_1 + \omega_2}{2}$ $\quad \omega_e \equiv \frac{\omega_1 - \omega_2}{2}$




## Symmetric Coupled Pendula




Displace one mass (while holding the other at equilibrium) & release:

$F = ma \rightarrow$

$$\ddot{z}_1 + \omega_p^2 z_1 + \omega_0^2 (z_1 - z_2) = 0 \quad (A)$$

$$\ddot{z}_2 + \omega_p^2 z_2 + \omega_0^2 (z_2 - z_1) = 0 \quad (B)$$

Guess solutions:

$$z_1 \stackrel{?}{=} C_1 e^{i\omega_1 t} \qquad z_2 \stackrel{?}{=} C_2 e^{i\omega_2 t}$$