Summary: Vibrations - Forced Response 2

EOM: For forced response:

$$M\ddot{x} + C\dot{x} + Kx = F_0 sin\Omega t \quad \Rightarrow \quad \ddot{x} + 2\zeta\omega_n \dot{x} + \omega_n^2 x = \frac{F_0}{M} sin\Omega t$$
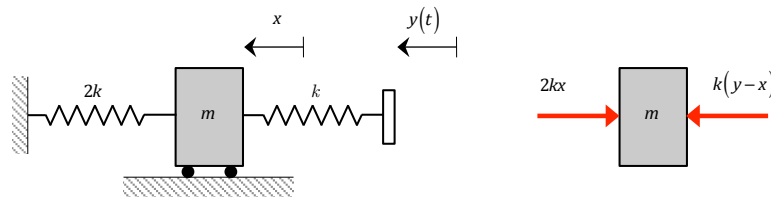
PARTICULAR SOLUTION

$$x_P(t) = Asin\Omega t + Bcos\Omega t$$

Substitute into EOM and solve for *A* and *B*. If the system is <u>undamped</u>, then you will find that *B = 0*.

BASE EXCITATION: For many problems, the energy input is through a moving support (prescribed motion, y(t)), rather than an applied force. <u>*Example*</u>:

$$\sum F_x = -2kx + k(y-x) = m\ddot{x} \quad \Rightarrow \quad m\ddot{x} + 3kx = \boxed{ky(t)} \quad \text{base excitation}$$