

$$\Rightarrow X_1(t) = a_1 \cos t + \frac{a^3}{32\omega_0^3} \cos 3t$$

initial condition  $X_1(0) = 0 \Rightarrow a_1 = -\frac{a^3}{32\omega_0^3}$

$$\Rightarrow X_1(t) = \frac{a^3}{32\omega_0^3} (-\cos t + \cos 3t)$$

no divergencis

dangerous resonances are typical for  
perturbation theory in classical mechanics.