

MAT 239 (Differential Equations), Prof. Swift
Worksheet 23, Driven Oscillators

The nondimensional form of the ODE for a driven, damped oscillator is

$$y'' + \frac{1}{Q}y' + y = \cos(\omega t),$$

where Q and ω are positive, dimensionless constants. The quality factor Q measures the friction (also called damping), and ω is the ratio of the driving frequency to the natural frequency ω_0 .

1. Use the method of undetermined coefficients to find a particular solution to $y'' + y = \cos(\omega t)$ with $\omega \neq 1$. This is the limit of $Q \rightarrow \infty$, which means zero friction. Write down the form of the particular solution y_p , with constants A and B , then find A and B as functions of ω .

2. Use the method of undetermined coefficients to find a particular solution to $y'' + \frac{1}{Q}y' + y = \cos(t)$. This is the case where $\omega = 1$. Write down the form of y_p , then find A and B as functions of Q .