APPM 2460 Homework 11:
Visualizing Beats and Resonance

April 17, 2018

Consider the ODE for a simple harmonic oscillator, $mx'' + bx' + kx = f(t)$. What are the conditions on m, b, k, and f such that the system exhibits BEATS? What about RESONANCE?

Consider the differential equation $3x'' + 12x = f(t)$.

1. Solve the system with $f(t) = \cos(2t)$, and initial conditions $y(0) = 1$, $y'(0) = 0$.

   - Use Matlab's `subplot` command to create one figure with two separate plots:
     On top, plot the homogeneous solution and the particular solution together for $0 \leq t \leq 20$.
     Below, plot the general solution, $y(t) = y_h + y_p$ for $0 \leq t \leq 20$.

2. Solve the system with $f(t) = \cos(2.5t)$, and initial conditions $y(0) = 1$, $y'(0) = 0$.

   - Use Matlab's `subplot` command to create one figure with two separate plots:
     On top, plot the homogeneous solution and the particular solution together for $0 \leq t \leq 20$.
     Below, plot the general solution, $y(t) = y_h + y_p$ for $0 \leq t \leq 20$.

3. What do you notice about the solution? Is this consistent with your understanding of beats.

4. Homework Assignment: Turn in a pdf with your plots and code from (1) and (2) only.