Written HW6 – MATH 3504 Spring 2021
Due by 24 February for timely completion credit

We will explore resonance in this homework. Consider the differential equation

$$x'' + 3x = \sin(\omega t), \tag{1}$$

where ω is an unknown constant.

#1. Find the general solution of homogeneous differential equation $x'' + 3x = 0$.

#2. Solve the nonhomogeneous equation (1) using the method of undetermind coefficients (*note: your solution will have the constant "ω" in it*).

#3. Use your general solution above to find the solution which is subject to the initial conditions $x(0) = 0$ and $x'(0) = 1$.

#4. Write and plot the solution found in #3 using three different **integer** values of for $\omega \neq 0$. Include your plots in your submission.

#5. What value of ω would make equation (1) resonant? For this value of ω, do the method of undetermined coefficients again to solve (1) (*note: redoing it is required – think about why!*). Plot the solution for this value and describe how it looks differently to the solutions you plotted in #4. Include your plot in the submission.