1 / a) Solve the DE and plot the solution in the interval [0, 150]

\[ y'' + 9.61y = \cos(3t), \ y(0) = 0, \ y'(0) = 0 \]

*Notice the beat from the graph.*

b) Solve the DE and plot the solution in the interval [0, 50]

\[ y'' + 9.61y = \cos(3.11t), \ y(0) = 0, \ y'(0) = 0 \]

*Notice the resonance from the graph.*

2 / Solve the DE and plot the solution in the interval \([\pi, 30\pi]\)

\[ y'' + ty' + (1 - 0.25t^{-2})y = t^{-3/2}, \ t > 0, \ y(\pi) = 0, \ y'(\pi) = 0. \]

3 / Using the “laplace” command, solve the IVP and plot the solution in the interval \([0, 20\pi]\)

\[ y'' + 0.24y' + y = 2\text{Dirac}(t - \pi) + 15\text{Dirac}(t-10\pi), \ y(0) = 0, \ y'(0) = 0. \]

4 / a) Find the eigenvalues and eigenvectors of the matrix \(A = \begin{pmatrix} -1.4 & -1.22 \\ 2 & 1 \end{pmatrix}\)

b) Solve the IVP \(X' = AX, \quad X(0) = \begin{pmatrix} 1.6 \\ 4 \end{pmatrix}\)

c) Plot the solution, as a parametric curve, from \(t = 0\), to \(t = 8\pi\)