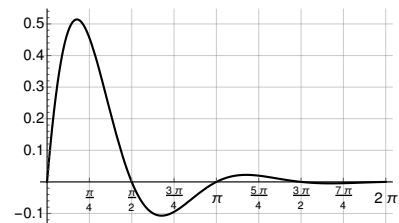


3. [15 points] For all of the following, the equations are linear, constant-coefficient, and second-order, with the coefficient of y'' picked to be one.

a. [5 points] If the differential equation is nonhomogeneous and the general solution is $y = c_1 e^{-2t} + c_2 e^{-3t} + 4 \cos(2t)$, what is the differential equation?

b. [5 points] If the graph to the right shows the movement of a unit mass on a spring with damping constant 2, set in motion with an initial velocity of 1 m/s, write an initial value problem modeling the position of the mass.



c. [5 points] Consider the (linear, constant-coefficient...) equation $L[y] = 0$ and the equivalent system $\mathbf{x}' = \mathbf{A}\mathbf{x}$. If one solution to the equation $L[y] = 0$ is $y = e^{-t}$, what is a corresponding solution to the system? If the coefficient of y in the equation is 3, what is the differential equation?