PROBLEMS

From the textbook 7.3, 7.5

1. Use Laplace transforms to find \( y(t) \) where \( y(0) = 0 \), \( y'(0) = 0 \) and \( m y''(t) + k y(t) = f_o \delta(t) \)

2. Suppose \( y(t) \) satisfies the equation:
   \[ y''(t) + y'(t) + 25 y(t) = f(t) \]
   subject to the initial conditions: \( y(0) = 0 \) and \( y'(0) = 0 \).
   Use Laplace transforms to do the following exercises

a. Find and plot the solution, \( y_i(t) \), when \( f(t) \) is the unit impulse \( \delta(t) \).

b. At what value of time \( t_0 \) is \( y_i \) first equal to zero? \( (t_0 > 0) \).

c. Find and plot the solution, \( y_H(t) \), when \( f(t) \) is the unit step function \( H(t) \).

d. From the plot determine the time \( t_m \) at which \( y_H \) is maximum. What is the maximum value of \( y_H \)? How does \( t_m \) compare with \( t_0 \) from part b?

e. Explain the results that you got in part d.