S13) Determine the Laplace transform (unilateral), and the region of convergence for each of the following functions of time

a) \( x(t) = e^{-2t} + e^{-3t} \)

b) \( x(t) = e^{2t} + e^{3t} \)

c) \( x(t) = e^{-4t} + e^{-5t} \sin(5t) \)

d) \( x(t) = te^{-2t} \)

e) \( x(t) = \begin{cases} 1 & 0 < t \leq 1 \\ 0 & \text{elsewhere} \end{cases} \)

f) \( x(t) = \begin{cases} t & 0 < t \leq 1 \\ 2 - t & 1 < t \leq 2 \end{cases} \)

g) \( x(t) = \delta(t) + u(t) \)

h) \( x(t) = \delta(3t) + u(5t) \)

S14) Create the pole/zero plot for each of the Laplace transforms that you derived in S13

S15) A LTI system with input \( x(t) \) and output \( y(t) \) is described by the following differential equation

\[
\frac{d^2 y(t)}{dt^2} + 3 \frac{dy(t)}{dt} + 2y(t) = x(t)
\]

Use Laplace transforms to determine the output if the input and initial conditions are

\[
x(t) = u(t) \quad y(0) = 1.0 \quad \left. \frac{dy(t)}{dt} \right|_{t=0} = 0
\]