Useful identities:
\[
\cos(x) = (e^{jx} + e^{-jx})/2 \\
\sin(x) = (e^{jx} - e^{-jx})/2j \\
f(|s|) = u(s)f(s) + u(-s)f(-s)
\]

1) Consider the discrete Linear Time Invariant (LTI) system with Impulse Response \( h[n] = u[n] \):
   a) For \( x[n] = u[n] \), compute \( y[n] \)
   b) For \( x[n] = u[n]\alpha^n, |\alpha| < 1 \), compute \( y[n] \)

2) Consider the following continuous LTI systems with different Impulse Responses, when given a common input signal \( x(t) = u(t) \):
   a) For \( h(t) = u(t) \), compute \( y(t) \) and simplify.
   b) For \( h(t) = u(t)e^{-bt}, b > 0 \), compute \( y(t) \) and simplify.
   c) For \( h(t) = u(t)e^{j\omega t} \), compute \( y(t) \) and simplify.
   d) For \( h(t) = u(t)\cos(\omega t) \), compute \( y(t) \) and simplify.

3) Consider the continuous LTI system with Impulse Response \( h(t) = u(t)e^{-at}, a > 0 \):
   a) For \( x(t) = u(t) \), compute \( y(t) \) and simplify.
   b) For \( x(t) = u(t)e^{-at} \), compute \( y(t) \) and simplify.
   c) For \( x(t) = u(t)e^{j\omega t} \), compute \( y(t) \) and simplify.

4) Consider the continuous LTI system with Impulse Response \( h(t) = u(t)e^{-at}e^{j\omega t}, a > 0 \):
   a) For \( x(t) = u(t) \), compute \( y(t) \) and simplify.
   b) For \( x(t) = u(t)e^{-bt}, b > 0, b \neq a \), compute \( y(t) \) and simplify.

5) Consider the continuous LTI system with Impulse Response \( h(t) = u(t)e^{-at}\cos(\omega_0 t), a > 0 \):
   a) For \( x(t) = u(t) \), compute \( y(t) \) and simplify.
   b) For \( x(t) = u(t)e^{-bt}, b > 0, b \neq a \), compute \( y(t) \) and simplify.

6) Consider the continuous LTI system with Impulse Response \( h(s) = \delta(s - s_0) \):
   a) For \( x(s) = \cos(\omega s) \), compute \( y(s) \) and simplify.
b) Describe in a few words the effect of this system

7) Consider the continuous LTI system with Impulse Response \( h(s) = e^{-a|s|} \), \( a > 0 \):
   a) For \( x(s) = e^{j\omega s} \), compute \( y(s) \) and simplify.
   b) For \( x(s) = \cos(\omega s) \), compute \( y(s) \) and simplify.

8) Compute and simplify:
   a) \( \int_{-\infty}^{\infty} \cos(\omega t)\delta(t - t_0)dt \)
   b) \( \int_{-\infty}^{\infty} \cos(\omega t)\delta'(t - t_0)dt \)
   c) \( \int_{-\infty}^{\infty} \cos(\omega t)\delta''(t - t_0)dt \)

9) Compute and simplify:
   a) \( \cos(\omega t) * \delta(t) \)
   b) \( \cos(\omega t) * \delta(t - t_0) \)
   c) \( \cos(\omega t) * \delta'(t) \)