1. Classify the following continuous-time systems as linear/nonlinear, causal/noncausal, and time invariant/time varying (and give reasons):

   (a) \( y(t) = x(t) + x(t + 1) \)
   (b) \( \frac{dy}{dt} = x^3 \)
   (c) \( \frac{d^2y}{dt^2} + \frac{dy}{dt} = x \)

2. The step response of a continuous-time system is observed to be \( e^{-t}u(t) \). Find the impulse response of the system. Is the system BIBO stable?

3. (Problem P-9.4 from the textbook; reproduced below for convenience) In each of the following cases, simplify the expression as much as possible using the properties of the continuous-time unit-impulse signal. Provide some explanation or intermediate steps for each answer.

   (a) \( e^{-(t-4)}u(t - 4)\delta(t - 5) \)
   (b) \( \int_{-\infty}^{t-5} \delta(\tau - 1)d\tau \)
   (c) \( \frac{d}{dt}\{e^{-(t-4)}u(t - 4)\} \)
   (d) \( \delta(t - 1) * \delta(t - 2) * \delta(t) \)