Problem 1:

a) Describe the following signal, \( x(t) \), in terms of some basis functions (e.g., step, impulse, ramp or sinusoidal).

![Graph of x(t)](image)

b) Make the labeled sketch of \( y(t) = 3 - 3x(t - 4) \) based on a given continuous time signal, \( x(t) \), show below.

![Graph of y(t)](image)
**Problem 2:**
A system is found to have zero-state response, $y(t)$, when the input, $x(t)$, is applied. Is this system a) causal, b) time-varying, c) zero-memory, and/or d) zero-state linear? Justify your answer. (hint: find how $x(t)$ and $y(t)$ are related, then proceed as usual.)
Problem 3:
A continuous-time signal $x(t)$ has the Laplace transform

$$X(s) = \frac{s + 1}{s^2 + 5s + 7},$$

determine the Laplace transform $V(s)$ for

$$v(t) = x(t) \sin 2t.$$
Problem 4:
Determine the Laplace transform of the following signal, $x(t)$, with an infinite number of chopped sinusoidal waves.
Problem 5:
A continuous-time system is defined by the input-output differential equation
\[
\frac{d^2 x(t)}{dt^2} + 4 \frac{dy(t)}{dt} + 3y(t) = 2 \frac{d^2 x(t)}{dt^2} - 4 \frac{dx(t)}{dt} - x(t),
\]
compute the response, \( y(t) \), for all \( t \geq 0 \), when
\[
y(0^-) = -2 \quad \dot{y}(0^-) = 1 \quad \text{and} \quad x(0) = 0(t).
\]