1. Problem 1 (30pts)
Determine $x[n]$ given its DTFS $X[k] = e^{-j\frac{2\pi}{2} \sin (\frac{\pi}{2}) + \cos (\frac{\pi}{3}) + 1}$.

2. Problem 2 (30pts)
$x(t)$ is depicted in the Fig. 2. Determine the appropriate Fourier representation of $x(t)$.

![Figure 1: Problem 2](image)

3. Problem 3 (40pts)
Let $x(t) = \cos^2 (\frac{\pi t}{2}) + 1$ be the input signal to the LTI system with the impulse response:

$$h(t) = e^{-t}u(t).$$

(a) Determine the frequency response $H(j\omega)$ of the system. (10pts)
(b) Determine the output signal $y(t)$ for the input $x(t)$. (20pts)
(c) Suppose you input a DC signal (constant signal) to the system. Is the output a constant signal as well? If so, does the system amplify (increase), attenuate (decrease), or does nothing to the amplitude of the input signal. (10pts)