Q.1 For the signal \( x(t) \) shown below, find

\[ a) \ X(0) \]
\[ b) \ \int_{-\infty}^{\infty} X(f) df \]

Q.2 Find the Fourier Transform of the following signals (using properties):

\[ a) \ x(t) = \frac{2a}{a^2 + t^2} \]
\[ b) \ x(t) = rect\left[ \frac{(t-1)}{2} \right] \]

\[ c) \]
Q.3 Consider the system shown below. The FT of the input signal $X(f)$ is also shown in figure.

Find the FT of the output $y(t)$ given that $w(t) = \cos(5\pi t)$ and $h(t) = \frac{\sin(6\pi t)}{\pi t}$.

\[
\begin{align*}
X(f) & \quad 1 \\
-\frac{1}{2} & \quad 0 & \frac{1}{2} & \quad f \\
\end{align*}
\]

\[
\begin{align*}
x(t) & \quad h(t) & \quad y(t) \\
w(t) & \quad \cos(5\pi t) \\
\end{align*}
\]

Q.4 Given $y(t) = x(t) * h(t)$ and $g(t) = x(3t) * h(3t)$, such that $g(t) = Ay(Bt)$, What is the value of A and B?

Q.5 A causal and Stable LTI system has the frequency response

\[
H(f) = \frac{j2\pi f + 4}{6 - (2\pi f)^2 + j10\pi f}.
\]

a) Find the Impulse Response.

b) What is the output when the input applied is

\[
x(t) = e^{-4t}u(t) - te^{-3t}u(t).
\]