3.19 \( h(t) = e^t u(-t) \)

a) If \( h(t) = 0 \) for \( t < 0 \) \( \Rightarrow \) \( h(t) \) is causal

Since \( h(t) \neq 0 \) for \( t < 0 \) \( \Rightarrow \) \( h(t) \) is non-causal

b) If \( \int_{-\infty}^{\infty} |h(t)| dt < \infty \) \( \Rightarrow \) \( h(t) \) is stable

Proof:
\[
\int_{-\infty}^{\infty} |e^t u(-t)| dt = \int_{-\infty}^{0} e^t dt = \int_{-\infty}^{0} e^t dt = e^t \bigg|_{-\infty}^{0} = e^0 - e^{-\infty} = 1 - 0 = 1 < \infty \Rightarrow \text{STABLE}
\]

c) \( x(t) = u(t) \) find \( y(t) = x(t) \cdot h(t) \)

\[
y(t) = \int_{-\infty}^{\infty} h(t) \cdot x(t-\tau) \ d\tau
\]

1. \( t < 0 \):
\[
y(t) = \int_{-\infty}^{t} e^\tau d\tau = e^\tau \bigg|_{-\infty}^{t} = e^t - e^{-\infty} = e^t
\]

2. \( t > 0 \):
\[
y(t) = \int_{0}^{t} e^\tau d\tau = e^\tau \bigg|_{0}^{t} = e^0 - e^{-\infty} = 1
\]

\[y(t) = e^t u(-t) + u(t)\]