1.28. Determine which of the properties from problem 1.27. hold for each of these discrete-time systems.

a) $y[n] = x[-n]$

1) $y[n_0]$ depends on $x[-n_0]$, where $-n_0 \neq n_0 \quad \forall n_0 \in \mathbb{R} \setminus \{0\}$ $\Rightarrow$ not memoryless

2) $x'[n] = x[n+k] \Rightarrow y'[n] = x'[-n] = x[-n+k]$

$y[n+k] = x[-(n+k)] = x[-n-k] \neq y'[n]$ $\Rightarrow$ not time invariant

3) $x'[n] = \alpha x_1[n] + \beta x_2[n] \Rightarrow y'[n] = x'[-n] = \alpha x_1[-n] + \beta x_2[-n]$

$\alpha y_1[n] + \beta y_2[n] = \alpha x_1[-n] + \beta x_2[-n] = y'[n]$ $\Rightarrow$ linear

4) $y[n_0]$ depends on $x[-n_0]$, where $-n_0 > n_0 \quad \forall n_0 < 0$ $\Rightarrow$ not causal

5) $|x[n]| \leq B \quad \forall n \in \mathbb{Z} \Rightarrow |y[n]| = |x[-n]| \leq B \Rightarrow$ stable

b) $y[n] = x[n-2] - 2x[n-8]$

1) $y[n_0]$ depends on $x[n_0-2]$, $n_0 \neq n_0-2$ $\Rightarrow$ not memoryless

2) $x'[n] = x[n+k] \Rightarrow y'[n] = x'[n-2] - 2x'[n-8] = x[n-2+k] - 2x[n-8+k]$

$y[n+k] = x[n+k-2] - 2x[n+k-8] = y'[n] \Rightarrow$ time invariant

3) $x'[n] = \alpha x_1[n] + \beta x_2[n] \Rightarrow y'[n] = x'[n-2] - 2x'[n-8] = \alpha x_1[n-2] + \beta x_2[n-2] - 2\alpha x_1[n-8] - 2\beta x_2[n-8]$

$\alpha y_1[n] + \beta y_2[n] = \alpha x_1[n-2] - 2\alpha x_1[n-8] + \beta x_2[n-2] - 2\alpha x_2[n-8] = y'[n] \Rightarrow$ linear

4) $y[n_0]$ depends on $x[n_0-2]$ and $x[n_0-8]$, $n_0-2 \neq n_0$, $n_0-8 \neq n_0$ $\Rightarrow$ causal

5) $|x[n]| \leq B \quad \forall n \in \mathbb{Z}$

$|y[n]| = |x[n-2] - 2x[n-8]| \leq |x[n-2]| + 2|x[n-8]| \leq 3B \Rightarrow$ stable