... 1.28. (2)

c) $y[n] = n x[n]$

1) $y[n_0]$ depends on x only at: $x_0 = x_{n_0}$ $\Rightarrow$ memoryless

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

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

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

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

4) memoryless $\Rightarrow$ causal

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

$|y[n]| = |n x[n]| = |n| \cdot |x[n]| \leq |n| \cdot B$ which isn't bounded $\Rightarrow$ not stable

d) $y[n] = \mathcal{E}v\{x[n-1]\} = \frac{x[n-1] + x[1-n]}{2}$

1) $y[n_0]$ depends on x at: $\begin{cases} n_0 - 1 \neq n_0 \\ 1 - n_0 \neq n_0 \end{cases} \Rightarrow$ not memoryless

2) $x'[n] = x[n+k] \Rightarrow y'[t] = \frac{x'[n-1] + x'[1-n]}{2} = \frac{x[n-1+k] + x[1-n+k]}{2}$

$y[n+k] = \frac{x[n+k-1] + x[1-(n+k)]}{2} \neq y'[t] \Rightarrow$ not time invariant

3) $x'[n] = \alpha x_1[n] + \beta x_2[n] \Rightarrow y'[t] = \frac{\alpha x_1[n-1] + \beta x_2[n-1] + \alpha x_1[1-n] + \beta x_2[1-n]}{2}$

$\alpha y_1[n] + \beta x_2[n] = \alpha \frac{x[n-1] + x_1[1-n]}{2} + \beta \frac{x_2[n-1] + x_2[1-n]}{2} = y'[n] \Rightarrow$ linear

4) $y[n_0]$ depends on x at $\begin{cases} n_0 - 1 \not> n_0 \\ 1 - n_0 > n_0 \ \forall \ n \leq 0 \end{cases} \Rightarrow$ not causal

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

$|y[n]| = \left|\frac{x[n-1] + x[1-n]}{2}\right| \leq \frac{1}{2} \cdot (|x[n-1]| + |x[1-n]|) \leq \frac{1}{2} \cdot 2B = B \Rightarrow$ stable