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Q1.] b.) $y(n) = \sin\left(\frac{3\pi}{4}(n+1)\right) x(n)$

there, we can see that there are no implicit function of time in the coefficients and also there are no constants. Hence, it is linear.
The system is time variant because of the presence of the term $x(n)$ i.e., it is an explicit function of time in coefficient.
Also, we can see that the system is cause and effect system, hence, it is causal in nature.
We have a term $\sin\left(\frac{3\pi}{4}(n+1)\right)$ and sine goes from $-1 \leq \sin(x) \leq 1$, hence, it is within the unit circle, hence, the system is stable.

Q1.] a.) $x_1(n) = \{1, 2, 3, 4\} = x_2(n)$. Here, all samples of signal will interact with all samples of the system.
The four step method is Flip → Shift → Multiply → Add
c.) In the first step, when we flip, the result is the same. Only the order is of the terms is changed. Hence, the order of beginning of $x_1(n)$ & $x_2(n)$ will not affect the output. Hence, Avinash's argument will be to overlook this step. Especially for the given $x_1(n)$ & $x_2(n)$, the output will not affect, but Aryan will say that the step may be necessary in other case as the causality is affected by it. When we shift, I guess all of them agree with the importance of the step. Only then we'll receive output for each input we give. From the fashion show example of our class, it is clear the multiplication step will have no effect as such on difference in result. Every judge has to interact with each and every one of the contestant.
In the last step of addition, we add the multiplied terms we get for the unique elements from the input.

Q2.] a.) $y(n) = x(n) + y(n-1) + y(n-2)$. By taking the z-transform,

$Y(z) = X[z] + z^{-1}Y(z) + z^{-2}Y(z)$

$\Rightarrow Y(z) - z^{-1}Y(z) - z^{-2}Y(z) = X(z)$

$\Rightarrow H(z) = Y(z) / X[z] = 1/(1 - z^{-1} - z^{-2}) = z^2/(z^2 - z - 1)$

$\therefore H(z) = \frac{z^2}{(z-1/2)^2 - 5/4} = \frac{z^2}{(z - 1/2 + \sqrt{5}/2)(z - 1/2 - \sqrt{5}/2)}$

$\therefore$ Zeroes are at $z = 0, 0$

Poles are at $z = \frac{1-\sqrt{5}}{2}, \frac{1+\sqrt{5}}{2}$, $|z| > \frac{1+\sqrt{5}}{2}$, i.e., $|z| > 1.61$

as system is causal. The system will be unstable since it does not contain an unit circle. Hence, an unstable system.