NAME: April 30, 2002
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EECS 20: Quiz

Consider a discrete-time LTI system S. Suppose that when the input is the discrete-time **unit step**, given by

$$u(n) = \begin{cases} 1 & n \geq 0, \\ 0 & n < 0, \end{cases}$$

then the output $y = S(u)$ is given by

$$y(n) = \begin{cases} 1 & n = 0, 1, \\ 0 & \text{otherwise.} \end{cases}$$

This output is called the **step response** because it is the response to a unit step.

1. Express y in terms of sums and differences of u and $D_2(u)$, where $D_2 = D_1 \circ D_1$ is the two-time step delay operator.

2. Give a signal flow graph that produces this result when the input is u.

3. One can show that if two LTI systems have the same step response, they are the same system. What is the frequency response of S?