Problem Wk.4.2.1: Difference Equations

Determine a difference equation (with finitely many terms) for each of the systems below.

A difference equation is in the form:

$$y[n] = c_0 y[n-1] + c_1 y[n-2] + \ldots + c_{k-1} y[n-k] + d_0 x[n] + d_1 x[n-1] + \ldots + d_j x[n-j]$$

Specify the dCoeffs: $d_0 \ldots d_j$ and the cCoeffs: $c_0 \ldots c_{k-1}$ for each of the difference equations below.

Recall that we use x to represent the input to a system and y the output of the system.

Refer to Section 5.7 of the notes for examples.

For each question, enter a sequence of numbers representing the coefficients.

If one set of coefficients is empty, enter none, otherwise enter a sequence of numbers separated by spaces (no commas, parens, brackets, etc).

1. The output at time n is the sum of its inputs up to and including time n.
   dCoeffs (input): [____]
   cCoeffs (output): [____]
2. The output at time n is the sum of its inputs up to and including time $n-1$.
   dCoeffs (input): [____]
   cCoeffs (output): [____]
3. The output at time n is the sum of the scaled inputs (each input scaled by 0.1) up to and including time $n-1$.
   dCoeffs (input): [____]
   cCoeffs (output): [____]

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