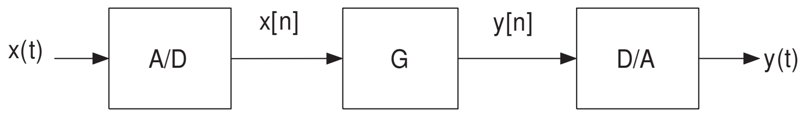
ELEC 431
Digital Signal Processing
Homework 5

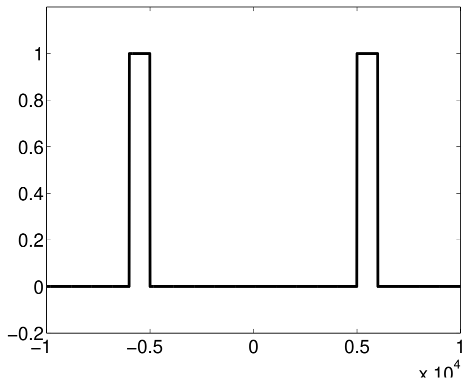
Due Monday, Feb. 3, 2003

Note: Homework, tests and solutions from previous offerings of this course are off limits, under the honor code.

Consider the DSP system depicted below.



The desired filtering is the bandpass filter shown below. The horizontal axis units are Hz (that is, we want a bandpass filter to pass frequencies $(-6000, -5000)$ and $(5000, 6000)$ Hz).



Assume the input $x(t)$ is bandlimited to $\pm$10kHz, and that ideal sampling and reconstruction are performed by the A/D and D/A with sampling period $T = 5 \times 10^{-5}$ samples/second.

a. Sketch the DTFT of $G(\omega)$ that will produce the desired filtering.

b. Suppose that we are going to implement $G(\omega)$ in the DFT domain. Which DFT coefficients will you keep and which will you set to zero?