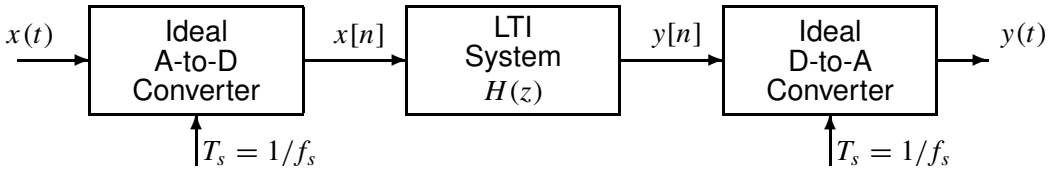
PROBLEM:

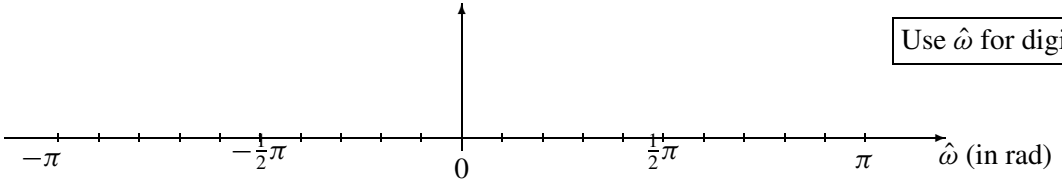
The input to the A-to-D converter in the figure below consists of a single sinusoid. The system function for the LTI system is a digital FIR filter. Since digital filters can be used to null out individual sinusoids, it should be possible to design $H(z)$ so that the output $y(t)$ will be zero.



(a) If the input $x(t)$ is a sinusoid:

$$x(t) = \cos(12000\pi t - \pi/5)$$

Determine the spectrum for $x[n]$ when $f_s = 10000$ samples/sec. Make a plot for your answer, but label the frequency, amplitude and phase of each spectral component.



(b) Using the same input signal as in part (a), determine the output signal, $y(t)$, when the digital filter has a system function defined by:

$$H(z) = 1 + z^{-5}$$