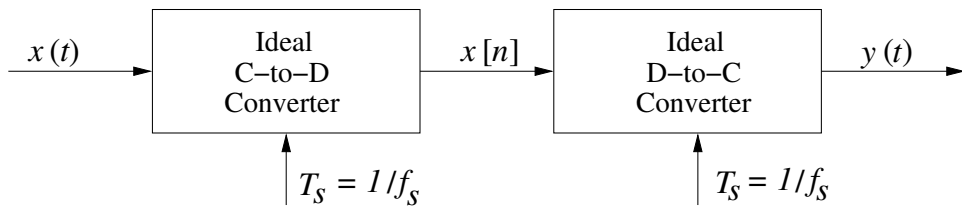


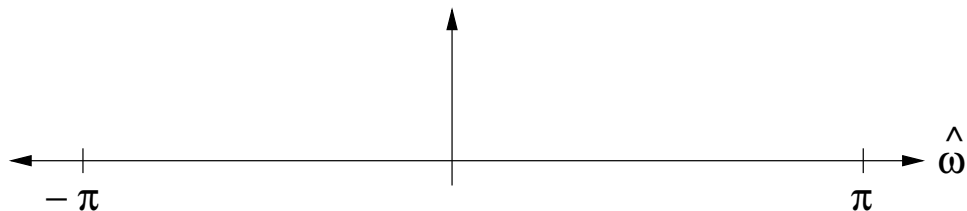
PROBLEM:

Shown in the figure above is an ideal C-to-D converter that samples $x(t)$ with a sampling period T_s to produce the discrete-time signal $x[n]$. The ideal D-to-C converter then forms a continuous-time signal $y(t)$ from the samples $x[n]$.

Let $x(t) = 12 \cos(2\pi(9000)t) + 7 \sin(2\pi(5000)t)$.

- (a) What is the minimum sampling rate such that $y(t) = x(t)$?

- (b) Sketch the digital spectrum of $x[n]$ when $f_s = 21000$ samples/sec. Carefully label the amplitudes and frequencies in your sketch.



- (c) If we under-sample $x(t)$, aliases of the spectral components can appear in the baseband of the digital spectrum. What is the maximum sampling rate $f_{s \max}$ such that the spectrum of $x[n]$ will have a non-zero DC component?

Determine the amplitude value for the DC component of $x[n]$ at this sampling rate.