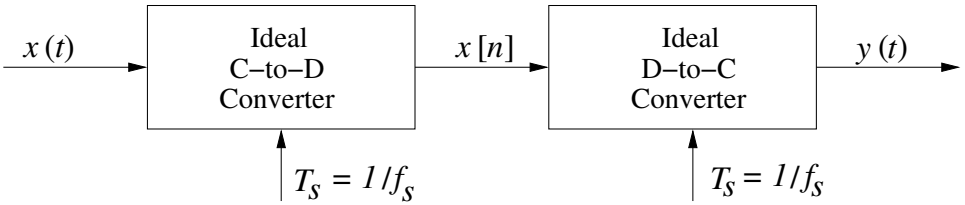
PROBLEM:



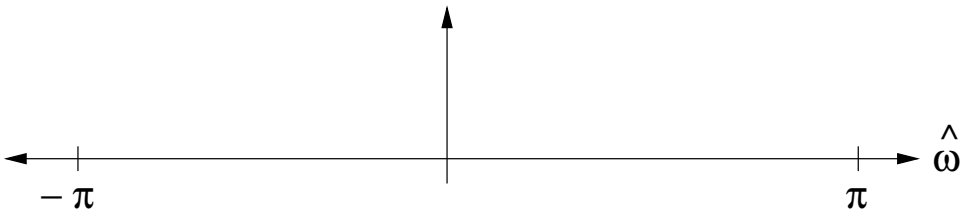
Shown in the figure above is an ideal C-to-D converter that samples $x(t)$ with a sampling period T_s to produce the discrete-time signal $x[n]$. The ideal D-to-C converter then forms a continuous-time signal $y(t)$ from the samples $x[n]$.

Let $x(t) = 6\cos(2\pi(8000)t) + 8\sin(2\pi(6000)t)$

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

$f_s =$

(b) Sketch the digital spectrum of $x[n]$ when $f_s = 20000$ 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?

$f_{s\,\max} =$

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

DC Value =