What is digital signal processing?

Basic DSP system:

Advantages:

- DSP hardware is flexible and programmable
- DSP chips are relatively cheap (easily mass-produced)
- Digital storage is cheap
- Digital information can be encrypted and compressed

Disadvantages:

Consider:

“That discipline which has allowed us to replace a circuit previously composed of a capacitor and a resistor with two antialiasing filters, an A-to-D and D-to-A converter, and a general purpose computer (or array processor) so long as the signal we are interested in does not vary too quickly.”

–Thomas P. Barnwell, 1974 (Source: A Course in DSP, Boaz Porat, 1997)

- Sampling leads to loss of information
- High-resolution fast A/D and D/A may be expensive
- Digital processing cannot always be done in real-time
In-class question

Consider the following system

\[ x_1[n] = x_1c(nT) \]

Suppose that \( x_1c(t) = \sin(2\pi(100)t) \) and \( T = \frac{1}{400} \).

(a) Determine and sketch the sequence \( x_1[n] \).

(b) Determine and sketch the Fourier transform of \( x_1[n] \), i.e., \( X_1(e^{j\omega}) \).