PROBLEM:
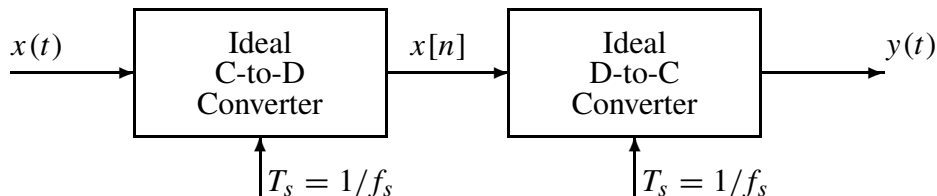
Consider the following system.

Suppose that the discrete-time signal $x[n]$ is given by the formula

$$x[n] = 10\cos(0.15\pi n + \pi/4)$$

(a) If the sampling rate is $f_s = 2000$ samples/second, determine two *different* continuous-time signals $x(t) = x_1(t)$ and $x(t) = x_2(t)$ that could have been inputs to the above system; i.e., find $x_1(t)$ and $x_2(t)$ such that $x[n] = x_1(nT_s) = x_2(nT_s)$ if $T_s = 0.0005$. Both of these input signals should have a frequency less than 2000 Hz. Give a formula for each signal.

(b) If the input $x(t)$ is given by the two-sided spectrum representation shown below, what condition must be satisfied by the sampling rate, $f_s = 1/T_s$, such that $y(t) = x(t)$?
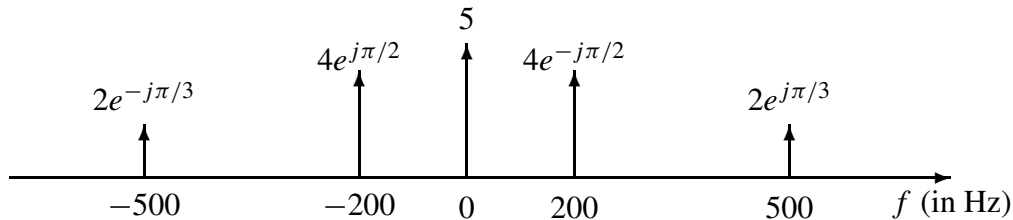
(c) What is the period of $x(t)$ in part (b)?