5. (25 points) Consider the signal

\[ x[n] = 5 \cos(0.2\pi n + \pi/4) \]

(a) Determine two different continuous-time signals \( x_1(t) \) and \( x_2(t) \) whose samples are equal to \( x[n] \) and whose frequencies are as small as possible when the sampling frequency is \( f_s = 100 \) samples/sec.

\[ \omega = \omega_0 + \frac{\pi}{2} \]

\[ \ell = 0, \quad f_s = 100 \quad \ell = 1, \quad f_s = 790 \]

(b) Determine the signal \( y(t) \) reconstructed from \( x[n] \) by an ideal D-to-C converter operating at a sampling rate of 200 samples/sec.

\[ y(t) = 5 \cos(40\pi(10t + \pi/4)) \]

(c) Suppose that the input \( x(t) \) of the ideal C-to-D converter is

\[ x(t) = 5 \cos(2\pi(10t + \pi/4)) \]

Determine two different sampling frequencies that are as large as possible so that the output of the C-to-D converter is \( x[n] \).

\[ \omega = \omega_0 + \frac{\pi}{2} \]

\[ \ell = 0, \quad f_s = 100 \]

\[ \ell = 1, \quad f_s = 79.1 \]