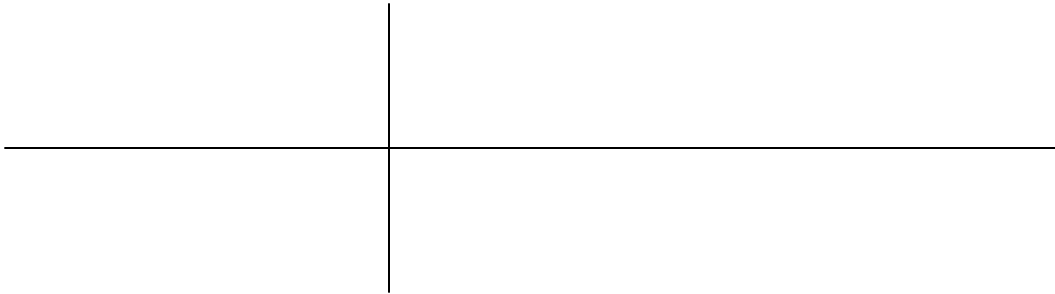


(1) Sketch *and label* a few cycles of the signal $x(t) = 10\cos\left(2\pi 5000t - \frac{\pi}{4}\right)$

Identify and label the peak values and zero crossing times.



(2) Next, the signal from part (1) is sampled at a rate $f_s = 8000$ Hz.

(a) Sketch the magnitude spectrum of the sampled signal over the frequency range $|f| < 16$ kHz.

(b) Now identify the *normalized radian frequency* ($\hat{\omega}$) for each spectral component in your sketch.

(c) If this sampled signal is reconstructed using a lowpass filter that eliminates spectral components greater than 4000 Hz, what frequency components will be present in the reconstructed signal? Explain your reasoning.