EE 341 - Homework 8

Due October 19, 2005

For problems which require MATLAB, please include a MATLAB m-file which shows how you made your plots.

1. Problem 5.31
2. Problem 5.34
3. Problem 5.36
4. Let $x(t) = 8\cos(2\pi t) + 6\cos(22\pi t) + 6\sin(32\pi t) + \cos(58\pi t) + \sin(66\pi t)$
   (a) What minimum sampling frequency F_s should be used to avoid aliasing?
   (b) $x(t)$ is sampled at $F_s = 80$ Hz. Sketch the sampled spectrum for $X_s(\omega)$.
   (c) The sampled signal from Part (b) is passed through a low pass filter with a bandwidth of 40 Hz. Sketch the spectrum of the signal $Y_s(\omega)$ which comes out of the low pass filter.
   (d) What frequencies are present in $y_s(t)$ from Part (c)?
5. Repeat Problem 3 for the sampling frequency $F_s = 10$ Hz.
6. The signal $x(t) = \cos(400\pi t) + \sin(800\pi t)$ is sampled with a sampling frequency $F_s = 500$ Hz.
   (a) Use MATLAB to plot the signals $\cos(400\pi t)$, $\sin(800\pi t)$ and $x(t)$. Use a time interval so you have several cycles of each signal, and a time spacing small enough so that the plots look smooth.
   (b) Let $x[n] = \cos(400\pi n T_s) + \sin(800\pi n T_s)$, where $T_s = 1/F_s$. Use the MATLAB `stem` function to plot $\cos(400\pi n T_s)$, $\sin(800\pi n T_s)$ and $x[n]$ (where n is an integer). Compare the sampled signals to the continuous-time signals from Part (a).