% Spectral Leakage Demonstration Code:

% % Change nT to an integer to eliminate spectral leakage. This would % %

% % suggest that the entire window could be periodic. A non-integer % %

% % nT precludes that our entire dataset can be periodic, so we get % %

% % spectral leakage. % %

nT = 8; % number of periods to simulate

fe = 5; %(Hz) excitation frequency

N = 2^11; % number of points in dataset

phi = 2\*pi\*rand; %(rad) phase shift

fs = (fe\*N)/nT; %(Hz) sample freq

df = fs/N; %(Hz) frequency resolution, using

t = (0:N-1)/fs; %(s) define sampled time vector

x = sin(2\*pi\*fe\*t - phi); %(mm) sampled signal using dt\*df\*N = 1

X = fft(x,N)/N; %(mm) Fourier Transform in amplitude units

X = abs([X(1) 2\*X(2:N/2)]); %(mm) make it a single-sided amplitude spectrum

f = (0:N/2-1)\*df; %(Hz) frequency vector

figure(2010)

subplot(2,1,1)

plot(t,x,'r-','linewidth',2)

xlabel('t (s)');

ylabel('x (mm)');

title('time domain)')

subplot(2,1,2)

semilogy(f,X,'r-','linewidth',2)

xlabel('f (Hz)')

ylabel('X (mm)')

xlim([0 20]) % zoom in on relevant frequency range

title('frequency domain')