clear all; close all;
% t=0:0.01:20; c=1; u=0; 1/(2*c); tt=t(501:1501);
% h=zeros(size(t)); h(951:1051)=1; % note area=1s*1=1.
% f=cos(2*pi*u0*t); plot(tt,f(501:1501),tt,h(501:1501),';r'); hold on
% g=conv(h,f,'same')*0.01; plot(tt,g(501:1501),';k'); hold off
%
% N=12; h=zeros(1,N); h(1:3)=1/6; h(10:12)=1/6; % h has area one
% H(1,:)=h;
% for j=2:N
%     H(j,j:N)=h(1:N-j+1); H(j,1:j-1)=h(N-j+2:N);
% end
% imagesc(H); colormap gray; axis square
% f=cos(2*pi*[1:12]/12)';
% g=H*f; figure; plot(f); hold on; plot(g,'k'); hold off

clear all; close all; %
N=256; Tt=1; % Number of pts in waveform and Tt=total duration in
dt=Tt/N; % sampling interval in s.
t=dt:dt:Tt; % time axis (important to begin after first increment
G(:,1) = 1.0*sin(2*pi*1*t)'; % generate time-harmonic functions...
G(:,2) = 2.0*cos(2*pi*1*t)'; % (notice the tick marks making column vectors.)
G(:,3) = 1.5*sin(2*pi*2*t)'; %cos(2pi ut)=sin(2pi ut + pi/2)
G(:,4) = 3.0*cos(2*pi*2*t)'; % We have sines and cosines at 1,2,3,and 3.5 Hz.
G(:,5) = 2.5*sin(2*pi*3*t)';
G(:,6) = 1.75*cos(2*pi*3.5*t); % Non-harmonic waveform
% psi = G'*G
psi = cov(G) % covariance matrix (zero lag, no norm, zero mean).
rho = corrcoef(G)
% Expand the sum of three cosine functions in a Fourier series.
t=0:0.01:10; % set a 10s time axis. T=0.01s and T0=10s
g1 = 1.5*cos(2*pi*1*t); % three time-harmonic functions...
g2 = 3.0*cos(2*pi*10*t);%
g3 = 4.5*cos(2*pi*25*t);%
g=g1+g2+g3; % ... summed to give g(t). u selected are 1,10,25 Hz
% for k=0:300; % for a basis set beginning at u0=1/T0=0.1 Hz at
% multiples up to 30Hz. I need to know when to
% stop, which means I need to know the bandwidth of g(t).
% C(:,k+1)=cos(2*pi*k*t/10)'; % notice the tick takes a transpose, so column vector.
end % Notice the number of frequencies (300) does not have to...
% equal the number of waveform points as it does in FFT.
A=2/10*g*C*0.01; % compute correlation integral at tau=0. dt=T=0.01s.
% This row vector holds the Fourier cosine coefficients.
% The integral is found from the matrix multiplication.
u=0:0.1:30; % Create a frequency axis for plotting.
% Note that du=1/T0=0.1Hz; U0=30 set above
subplot(3,1,1); plot(t,g); subplot(3,1,2); stem(u,A); %
G=fft(g); % Let's try another approach using Fourier transforms...
subplot(3,1,3); stem(u,2.0/10*abs(G(1:301))*0.01) % ... and plot the magnitude
% of the result.
%