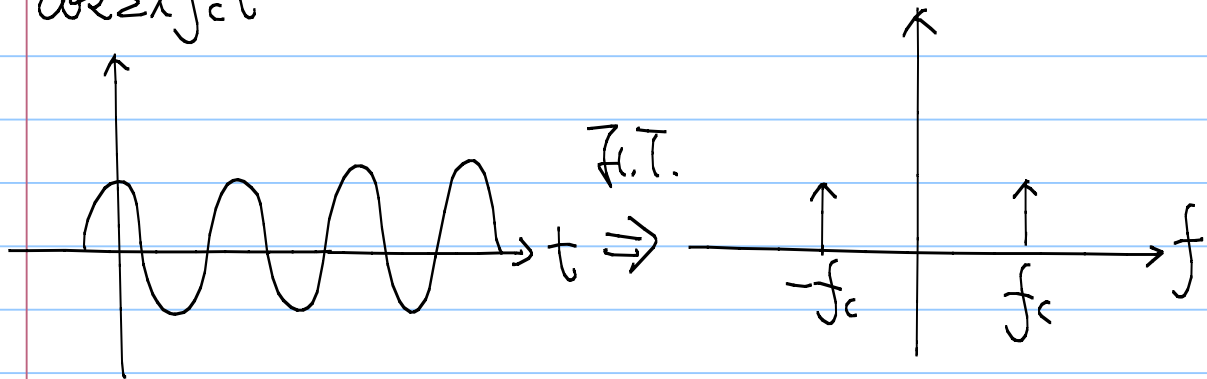


Usage of FFT

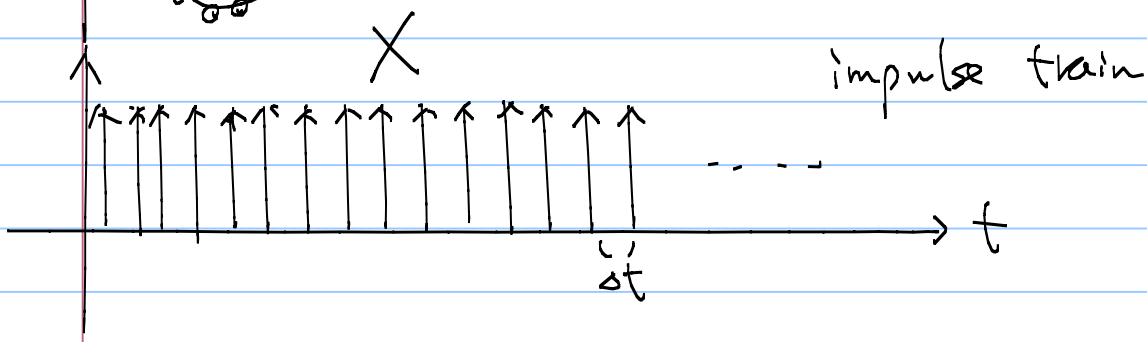
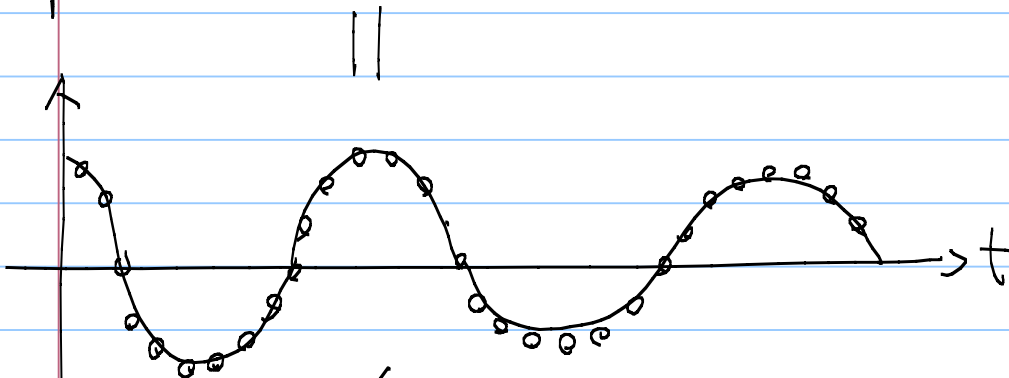
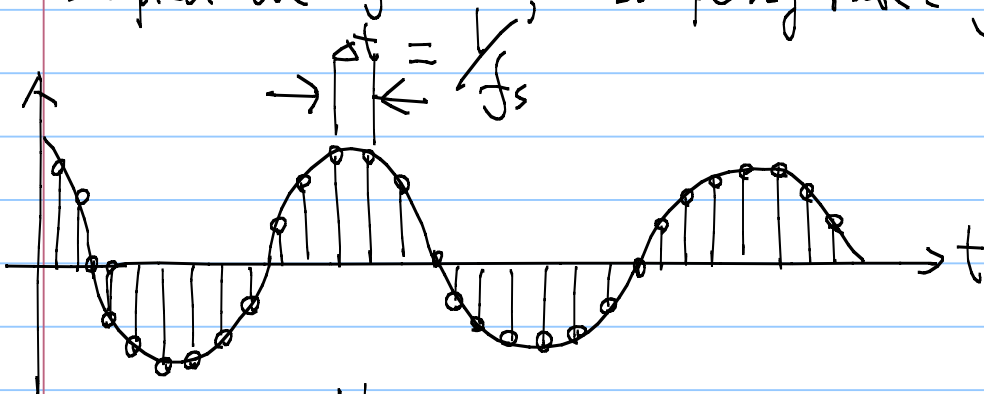
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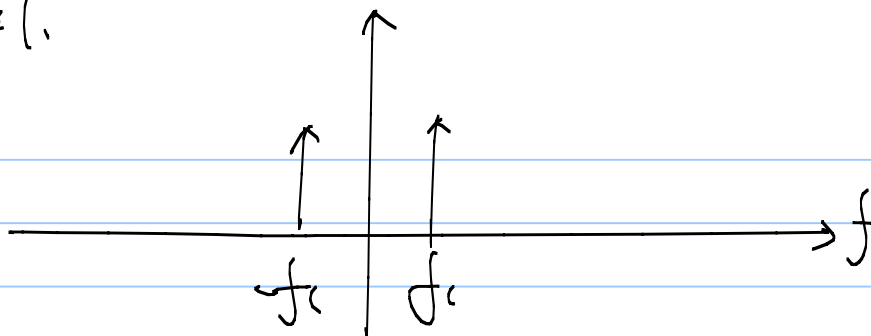
$\Rightarrow \cos 2\pi f_c t$



\Rightarrow sampled $\cos 2\pi f_c t$, sampling rate: f_s , $f_s \geq 2f_{\max}$

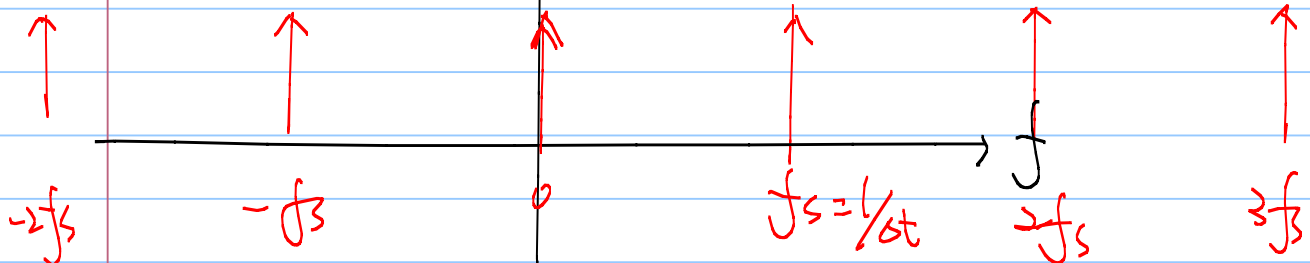


$\Rightarrow \mathcal{F}\{f\}$

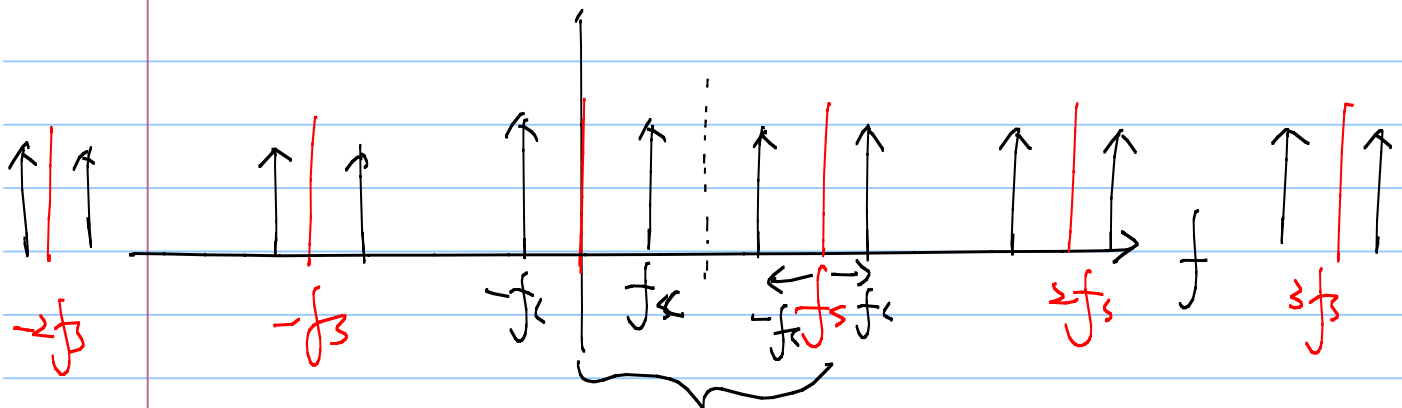


\otimes

impulse train



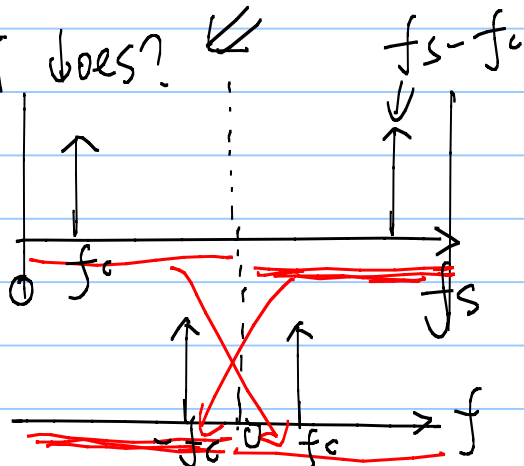
\Downarrow

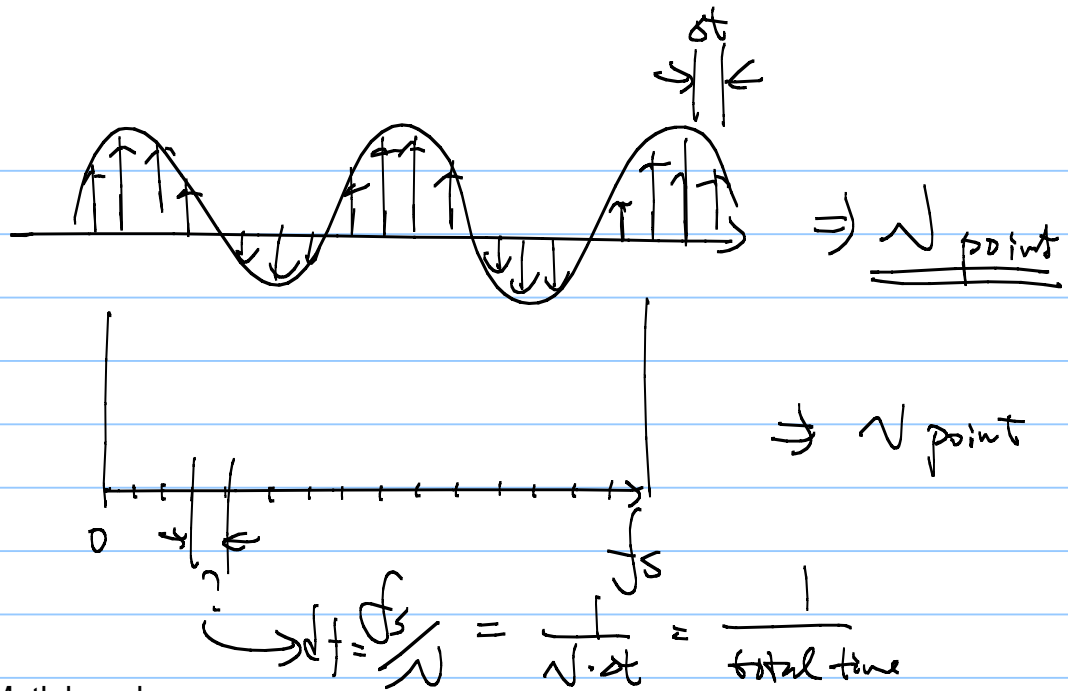


\Rightarrow What FFT does? \Leftarrow

fft \Rightarrow

fftshift





Example of Matlab codes:

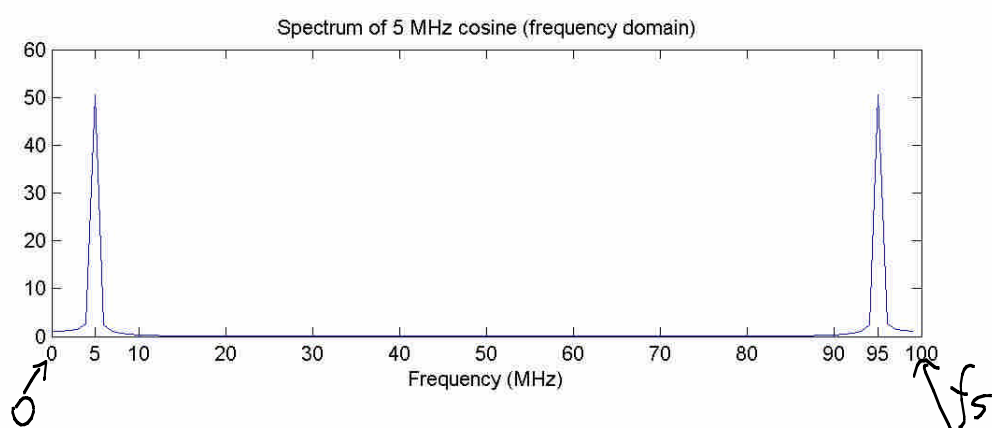
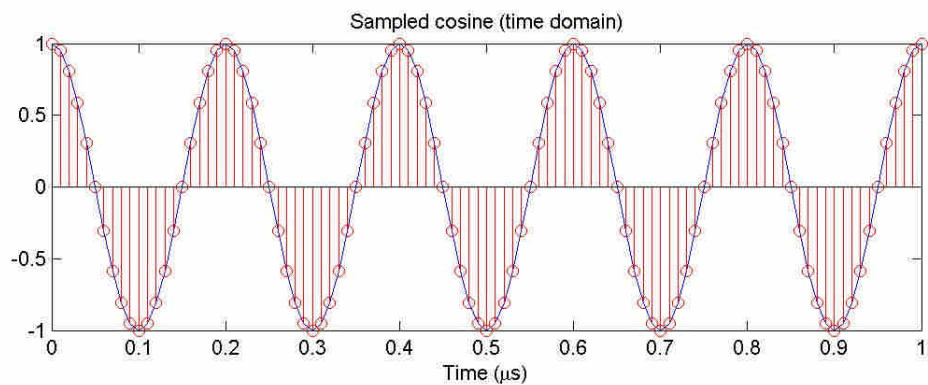
```
%
% Matlab script - FFT Example
% Edited by Meng-Lin Li, 10/05/2007
%

% Generate sampled cosine
fc = 5; % in MHz
fs = 100; % in MHz
Ncycle = 5; % number of cycles of sampled cosine
dt = 1/fs; % time resolution
t_axis = (0:dt:Ncycle/fc); % time axis
sampled_cos = cos(2*pi*fc*t_axis); % sampled cosine ,time domain
Npoint = length(sampled_cos); % number of points in sampled cosine

% Fourier transform
df = fs/Npoint; % frequency resolution
f_axis = (0:1:(Npoint-1))*df; % frequency axis
SAMPLED_COS = fft(sampled_cos); % spectrum of sampled cosine, frequency domain, complex
mag_SAMPLED_COS = abs(SAMPLED_COS); % magnitude
pha_SAMPLED_COS = angle(SAMPLED_COS); % phase

figure
subplot(2,1,1)
plot(t_axis, sampled_cos);
hold
stem(t_axis, sampled_cos,'r');
xlabel('Time (\mus)');
title('Sampled cosine (time domain)');

subplot(2,1,2)
plot(f_axis, mag_SAMPLED_COS);
xlabel('Frequency (MHz)');
title('Spectrum of 5 MHz cosine (frequency domain)')
set(gca,'xtick',[0 5 10 20 30 40 50 60 70 80 90 95 100]);
print -djpeg fft_example.jpg
```



\Rightarrow how about `fftshift(mag_Sampled_CS)`?