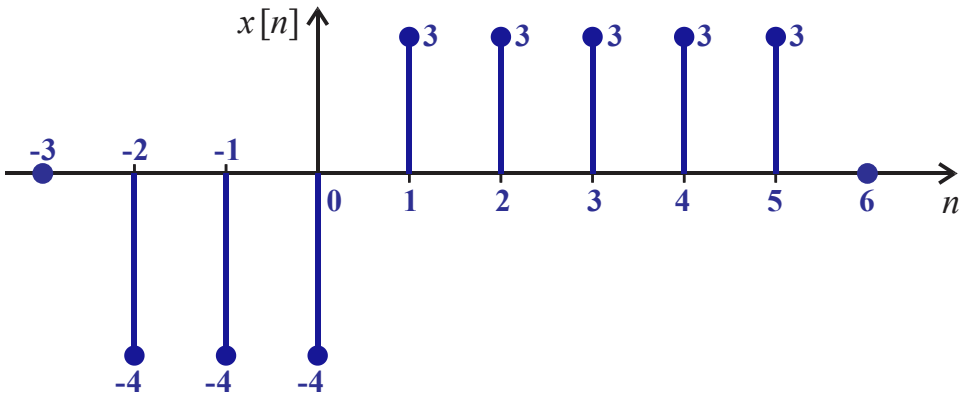
Compute the DTFT of the discrete-time signal $x[n]$ shown below in the simplest possible form. Plot the amplitude and phase spectrum for $-\pi \le \Omega \le \pi$ rad.



$$x[n] = -4\rho_3[n+1] + 3\rho_5[n-3]$$

Use Table 4.1 DTFT pair for a rectangular pulse of length $L = 2q+1$

$$\rho_{2q+1}[n] \leftrightarrow \frac{\sin[(q+1/2)\Omega]}{\sin(\Omega/2)}$$

Use Table 4.2 DTFT properties:

linearity $\quad ax[n] \leftrightarrow aX(\Omega)$

time-shift $\quad x[n-q] \leftrightarrow X(\Omega)e^{-jq\Omega}$

For $\rho_3[\,]$, $L = 2(1)+1$ $\quad (q=1)$ w/ $q=-1$ shift

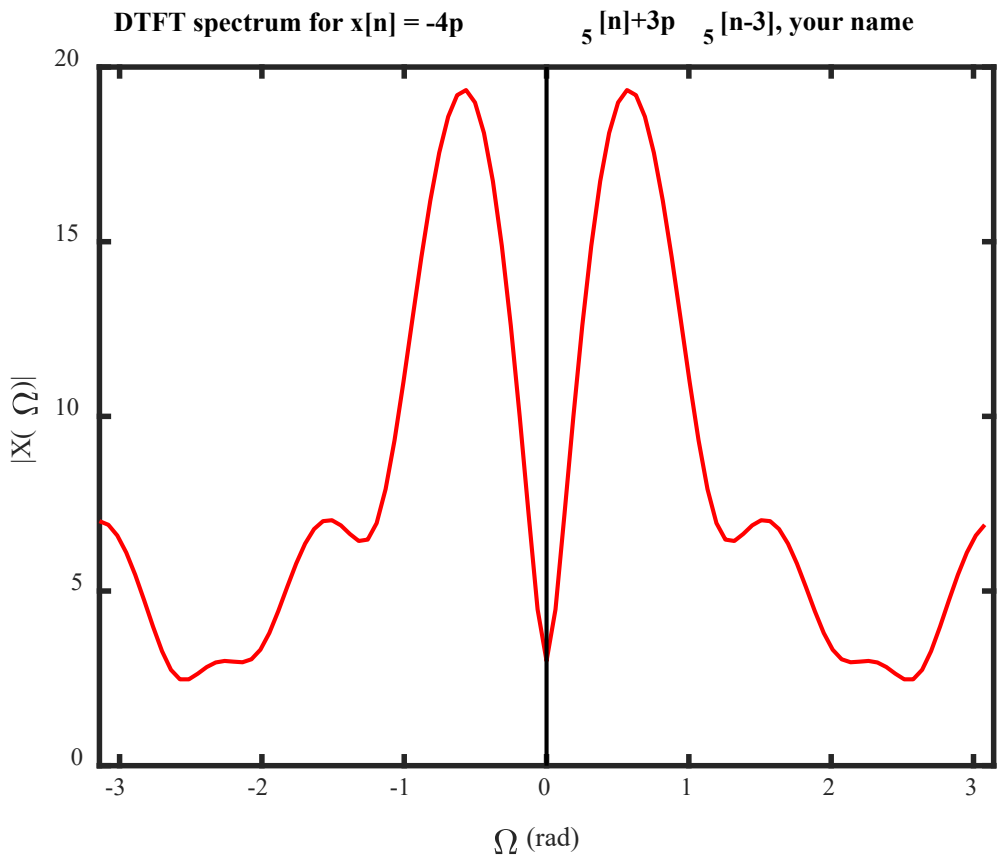
For $\rho_5[\,]$, $L = 2(2)+1$ $\quad (q=2)$ w/ $q=3$ shift

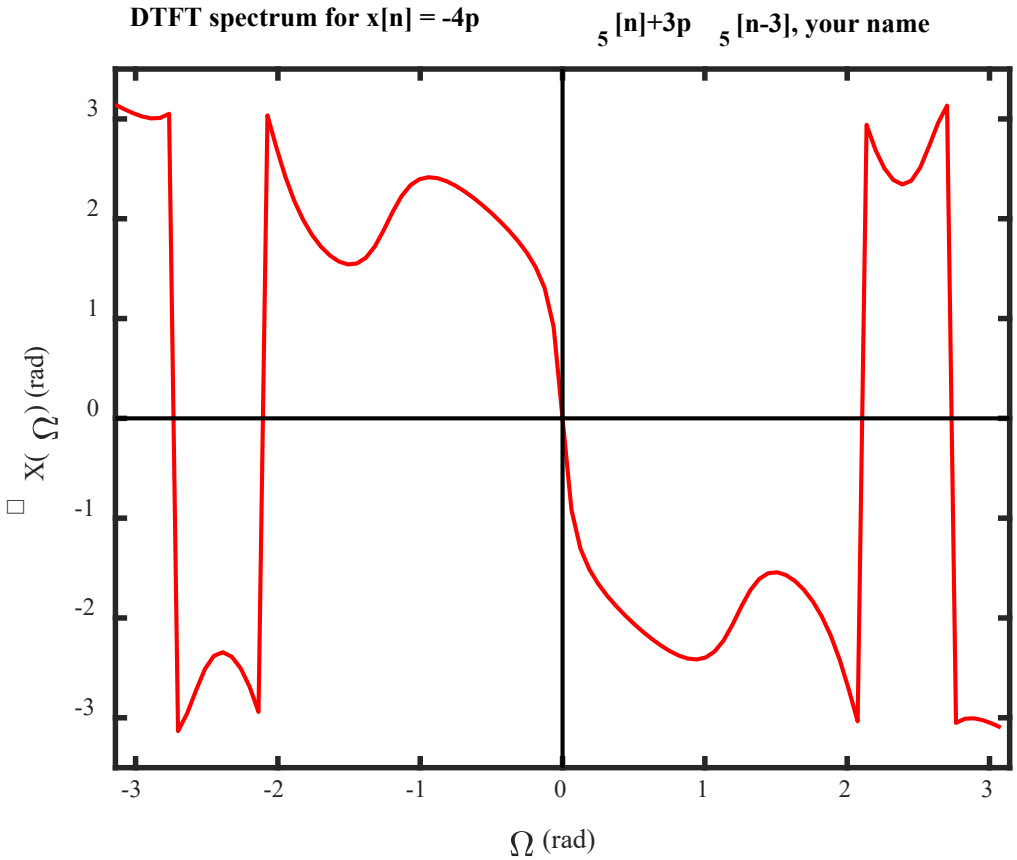
$$X(\Omega) = -4\,\frac{\sin[(1+1/2)\Omega]}{\sin(\Omega/2)}\,e^{+j(1)\Omega} + 3\,\frac{\sin[(2+1/2)\Omega]}{\sin(\Omega/2)}\,e^{-j3\Omega}$$

$$X(\Omega) = -4\,\frac{\sin(1.5\Omega)}{\sin(0.5\Omega)}\,e^{j\Omega} + 3\,\frac{\sin(2.5\Omega)}{\sin(0.5\Omega)}\,e^{-j3\Omega}$$

$$-\infty < \Omega < \infty$$

```
% EE 313 Signals and Systems, your name
% Plot DTFT magnitude and phase spectrum of
% x[n] = -4p3[n+1] + 3p5[n-3]
%
clear; clc; close all;
Omega = -pi:pi/50+eps:pi;  % Define frequency vector to avoid 0
X1 = -4*exp(j*Omega).*sin(1.5*Omega)./sin(0.5*Omega);
X2 = 3*exp(-j*3*Omega).*sin(2.5*Omega)./sin(0.5*Omega);
X = X1 + X2;
Xmag = abs(X); Xang = angle(X); % spectrum
% Plot amplitude and phase spectrum
plot(Omega,Xmag,'r-',[0 0],[0 20],'k-','linewidth',1.5),
axis([-pi pi 0 20]),
xlabel('\Omega (rad)','fontsize',16,'fontname','times'),
ylabel('|X(\Omega)|','fontsize',16,'fontname','times'),
title('DTFT spectrum for x[n] = -4p_5[n]+3p_5[n-3], your name',...
    'fontsize',16,'fontname','times'),
figure,
plot(Omega,Xang,'r-',[-pi pi],[0 0],'k-',[0 0],[-3.5 3.5],'k-',...
    'linewidth',1.5),
axis([-pi pi -3.5 3.5]),
xlabel('\Omega (rad)','fontsize',16,'fontname','times'),
ylabel('\angle X(\Omega) (rad)','fontsize',16,'fontname','times'),
title('DTFT spectrum for x[n] = -4p_5[n]+3p_5[n-3], your name',...
    'fontsize',16,'fontname','times'),
set(findobj('type','legend'),'fontname','times','fontsize',14)
set(findobj('type','line'),'linewidth',1.5,'markersize',18)
set(findobj('type','axes'),'linewidth',2,'fontname','times')
set(findobj('type','axes'),'fontsize',12)
```


DTFT spectrum for x[n] = -4p 5 [n]+3p 5 [n-3], your name
20
15
10
5
0
|X(Ω)|
-3
-2
-1
0
1
2
3
Ω (rad)


DTFT spectrum for x[n] = -4p 5 [n]+3p 5 [n-3], your name
3
2
1
0
-1
-2
-3
X(Ω) (rad)
-3
-2
-1
0
1
2
3
Ω (rad)