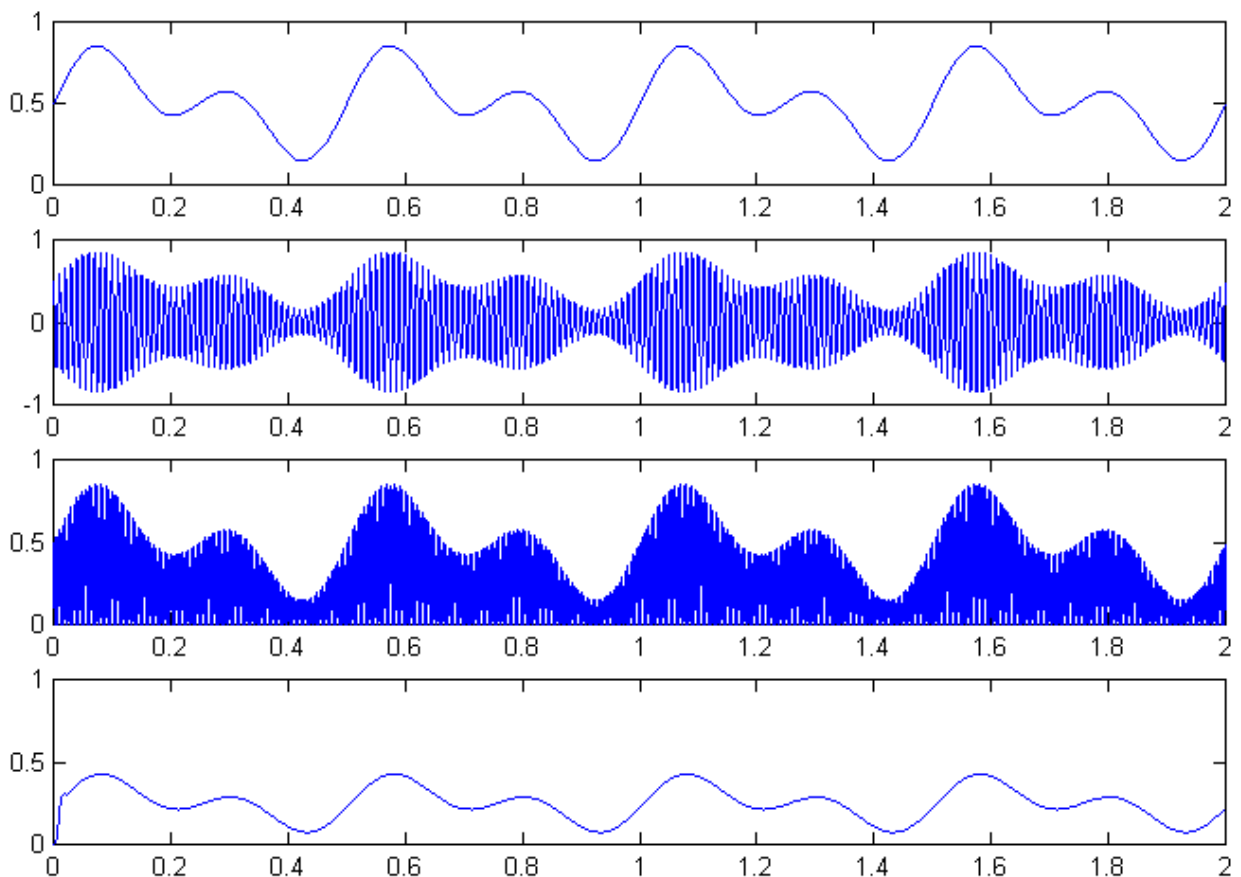


## Modulacja amplitudy.

```
% amod.m :Modulacja amplitudy
close;
Fc=100;
Fs=250;
n=[0:0.1/Fs:2];
%x=sawtooth(2*pi*2*n,0.5);
%x=sin(2*pi*2*n);
x=sin(2*pi*2*n) + sin(2*pi*4*n);
x=x/5+0.5; % aby nie przemodulowac !!!!!!!!!!!
subplot(4,1,1);
plot(n,x);
f=cos(2*pi*100*n);
k=0;
%k=10;
mod=x.*f +k*f;
subplot(4,1,2);
plot(n,mod);

TAU=0;
%TAU=pi/4;
f=cos(2*pi*100*n+TAU);
demod=mod.*f;
subplot(4,1,3);
plot(n,demod);
[b,a]=butter(5,0.05); %N-1, w <<<low pass
y=filter(b,a,demod);
%y=filtfilt(b,a,demod);
subplot(4,1,4);
plot(n,y);
```



```

% qmod.m :kwadraturowa modulacja amplitudy
close;
Fc=100;
Fs=250;
n=[0:0.1/Fs:2];
%x1=sawtooth(2*pi*2*n,0.5);
%x1=sin(2*pi*2*n);
x1=sin(2*pi*2*n) + sin(2*pi*4*n);

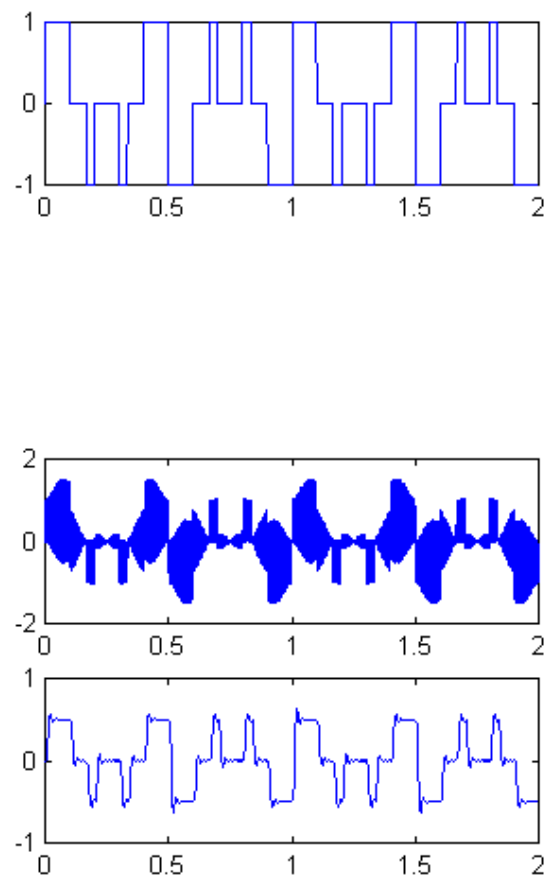
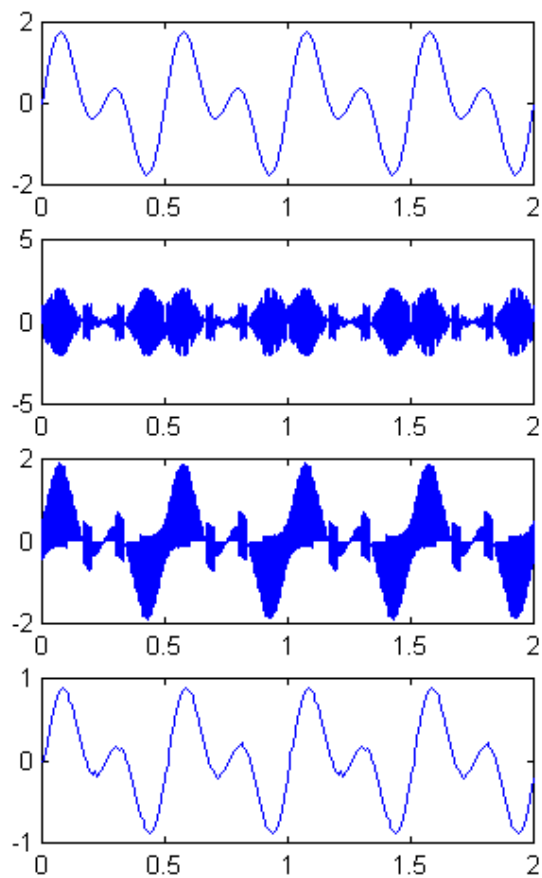
%x2=sawtooth(2*pi*3*n,0.5);
%x2=sign(sin(2*pi*3*n));
x2=sign(sign(sin(2*pi*3*n)) + sign(sin(2*pi*5*n)));

subplot(4,2,1);
plot(n,x1);
subplot(4,2,2);
plot(n,x2);

mod=x1.*cos(2*pi*100*n)+x2.*sin(2*pi*100*n);
subplot(4,2,3);
plot(n,mod);
%-----
TAU=0;
%TAU=pi/4;
demod1=mod.*cos(2*pi*100*n+TAU);
demod2=mod.*sin(2*pi*100*n+TAU);
subplot(4,2,5);
plot(n,demod1);
subplot(4,2,6);
plot(n,demod2);

[b,a]=butter(5,0.04); %N-1, w <<<low pass
y1=filter(b,a,demod1);
subplot(4,2,7);
plot(n,y1);
y2=filter(b,a,demod2);
subplot(4,2,8);
plot(n,y2);

```



```

% ex050800.m: Example 05.08: HiRes Spectr
% High resolution spectrum based on 100 samples of the signal x(n)

subplot(1,1,1)

n=[0:1:199];

x=cos(0.48*pi*n)+cos(0.52*pi*n);
subplot(2,1,1);stem(n,x);title('signal x(n), 0 <= n <= 199')
axis([0,200,-2.5,2.5])

X=fft(x);magX=abs(X(1:1:200));
k=0:1:199;w=2*pi/200*k;

subplot(2,1,2);
hold on;
stem(w/pi,magX,'r');
plot(w/pi,magX);
hold off;
title('DTFT Magnitude');xlabel('frequency in pi units')

axis([0,1,0,max(magX)]);
disp('Press RETURN to continue');pause;

%print -deps2 me0508c.eps; subplot
% Spectrum based on the first 10 samples of x(n)

n1=[0:1:9];y1=x(1:1:10);
subplot(2,1,1);stem(n1,y1);title('signal x(n), 0 <= n <= 9');xlabel('n')
axis([0,10,-2.5,2.5])

Y1=fft(y1);magY1=abs(Y1(1:1:6));
k1=0:1:5;w1=2*pi/10*k1;

subplot(2,1,2);stem(w1/pi,magY1);title('Samples of DTFT Magnitude');
xlabel('frequency in pi units')
axis([0,1,0,10])
disp('Press RETURN to continue');pause;
print -deps2 me0508a.eps; subplot

% high density Spectrum (50 samples) based on the first 10 samples of x(n)

n2=[0:1:49];y2=[x(1:1:10) zeros(1,40)];

subplot(2,1,1);stem(n2,y2);title('signal x(n), 0 <= n <= 9 + 40
zeros');xlabel('n')
axis([0,50,-2.5,2.5])

Y2=fft(y2);magY2=abs(Y2(1:1:26));
k2=0:1:25;w2=2*pi/50*k2;

subplot(2,1,2);plot(w2/pi,magY2);title('DTFT Magnitude');xlabel('frequency in pi
units')
axis([0,1,0,10])
disp('Press RETURN to continue');pause; subplot

% High density spectrum (100 samples) based on the first 10 samples of x(n)

n3=[0:1:99];y3=[x(1:1:10) zeros(1,90)];

```

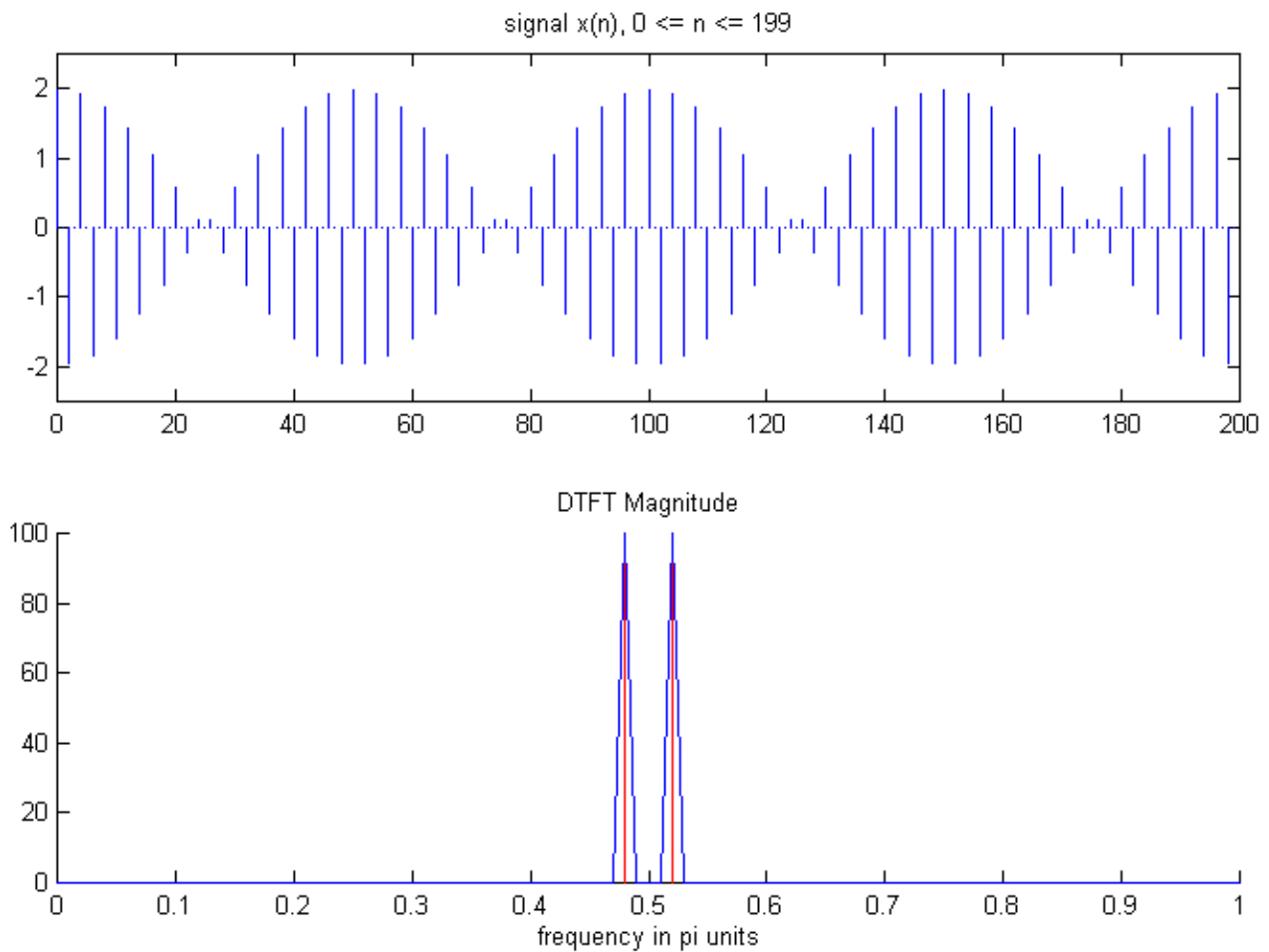
```

subplot(2,1,1);stem(n3,y3);title('signal x(n), 0 <= n <= 9 + 90
zeros');xlabel('n')
axis([0,100,-2.5,2.5])

Y3=fft(y3);magY3=abs(Y3(1:1:51));
k3=0:1:50;w3=2*pi/100*k3;

subplot(2,1,2);plot(w3/pi,magY3);title('DTFT Magnitude');xlabel('frequency in pi
units')
axis([0,1,0,10])
disp('Press RETURN to continue');pause;
%print -deps2 me0508b.eps; subplot

```



```

% dft_ex.m : Badanie DFT
% High resolution spectrum based on 200 samples of the signal x(n)

n=[0:1:199];
x=cos(0.48*pi*n)+cos(0.52*pi*n); % dudnienia
%x=cos(0.01*pi*n)+cos(pi*n);      % min and max f
%x=cos(1.99*pi*n);                % aliasing
%x=cos(0.015*pi*n)+cos(0.995*pi*n);
%x=cos(0.014*pi*n);
%x=sign(cos(0.004*pi*n));
%x=cos(1/3*pi*n+pi/2);
%x=cos(pi*n+pi/4);
%x=[ones(1,20), zeros(1,180)];    % prostokąt
%x=[ones(1,10), zeros(1,190)];
%x=sin(0.1*pi*n)./(0.1*pi*n+0.1); % sin(x)/x
%x=sin(0.1*pi*n)./(0.1*pi*n+0.1);
%x=randn(200);                    %szum
subplot(3,1,1);stem(n,x);title('signal x(n), 0 <= n <= 199')
axis([0,200,-2.5,2.5]);
    %wx=blackman(length(x));
    %X=fft(x.*wx');
X=fft(x);
magX=abs(X(1:1:200));angX=angle(X(1:1:200));
k=0:1:199;w=2*pi/200*k;

subplot(3,1,2);
hold on;
stem(w/pi,magX,'r');
plot(w/pi,magX);
%stemjm(w/pi,20*log10(magX),'r');
%plot(w/pi,20*log10(magX));
hold off;
title('DTFT Magnitude');xlabel('frequency in pi units')
axis([0,1,0,max(magX)]);
%axis([0,1,min(20*log10(magX)),max(20*log10(magX))]);
subplot(3,1,3);
stem(w/pi,angX,'g');
title('DTFT Phase');xlabel('frequency in pi units')
axis([0,1,min(angX),max(angX)]);

```

