Laboarator 2 - Pb rezolvate

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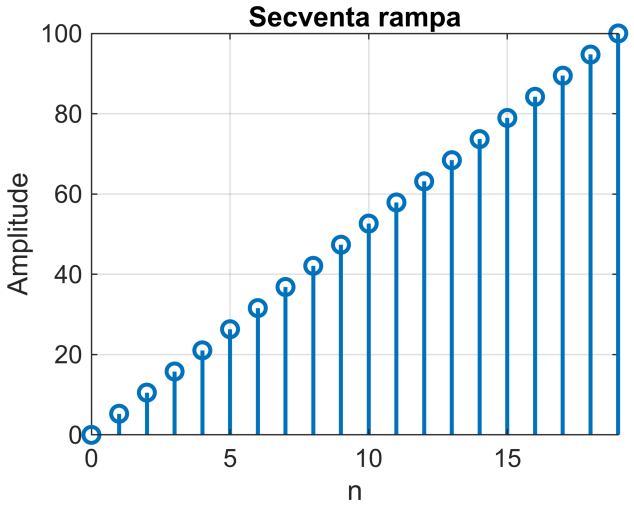
Semnalele analogice se reprez cu "plot", iar cele discrete in timp cu "stem"

Ex 1) Să se genereze și să se reprezinte grafic o secvență rampă, de lungime 20, cu valoare inițială 0 și valoare finală 100

```
clear variables;
n = 0:19;
x = (100/19)*n; % sau x = linspace(0,100,20);

figure, stem(n, x, 'LineWidth',1.5), grid,
xlabel('n'), ylabel('Amplitude'), title('Secventa rampa');
axis([0 19 0 100]);
```



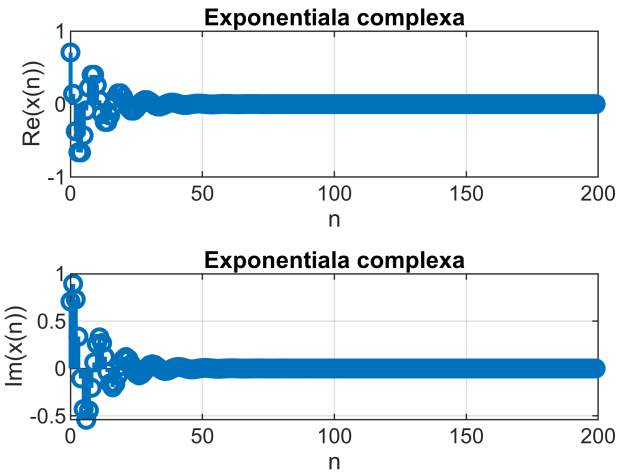
Ex 2) Să se reprezinte grafic secvențele

$x_1(n) = e^{-0.1n}\sin\left(2\pi 0.1n + \frac{\pi}{4}\right)$ si $x_2(n) = e^{-0.1n}\cos\left(2\pi 0.1n + \frac{\pi}{4}\right)$, generându-se doar secvența

$x(n) = e^{-0.1n + j\left(2\pi 0.1n + \frac{\pi}{4}\right)}$.

```
clear variables;
n = 0:199;
x_n = exp(-0.1*n + 1j*(2*pi*0.1*n + (pi/4)));
x_real = real(x_n);
x_img = imag(x_n);

figure,
subplot(211), stem(n, x_real, 'LineWidth',1.5), grid,
xlabel('n'), ylabel('Re(x(n))'), title('Exponentiala complexa');
```

```
subplot(212), stem(n, x_img, 'LineWidth',1.5), grid,
xlabel('n'), ylabel('Im(x(n))'), title('Exponentiala complexa');
```

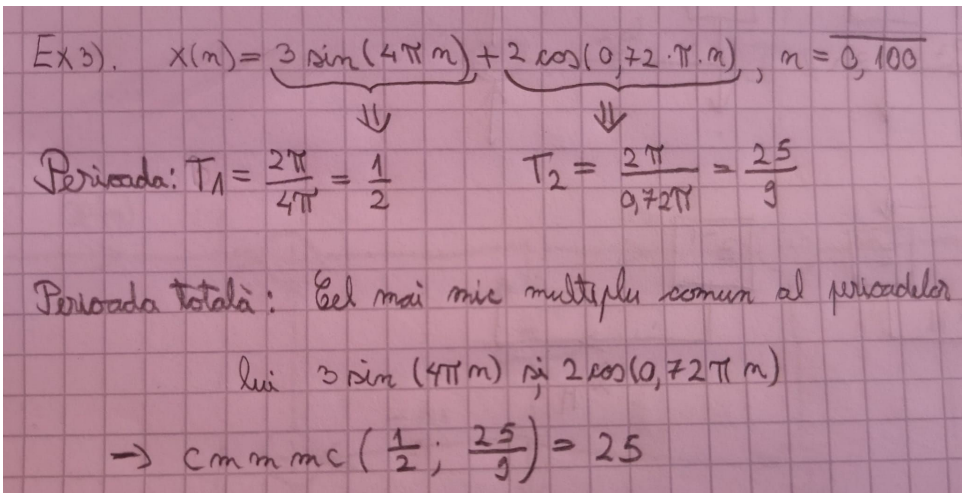


Ex 3) Să se reprezinte grafic secvența

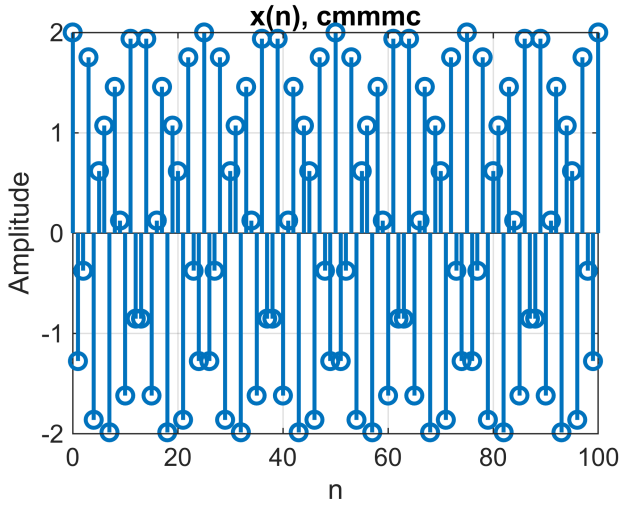
$$x(n) = 3\sin(4\pi n) + 2\cos(0.72\pi n),\ n = \overline{0, 100}.$$

Este această secvență periodică? Dacă da, care este perioada?

R: Secventa periodica de perioada = 25.



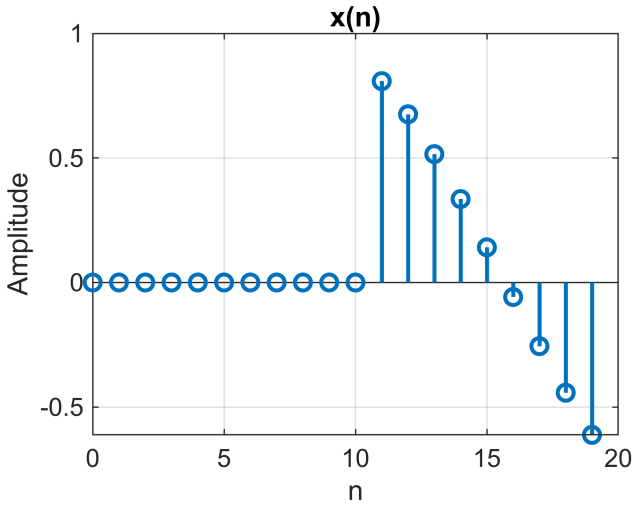

```
clear variables;
n = 0:100;
x_n = 3*sin(4*pi*n) + 2*cos(0.72*pi*n);

figure, stem(n, x_n, 'LineWidth',1.5), grid,
title('x(n), cmmmc'), xlabel('n'), ylabel('Amplitude');
```



Ex 4) Să se reprezinte grafic secvența de lungime 20

$$x(n) = \begin{cases} \sin(0.2n), & n > 10 \\ 0, & n \leq 10 \end{cases}, \; n \in \mathbb{N}.$$

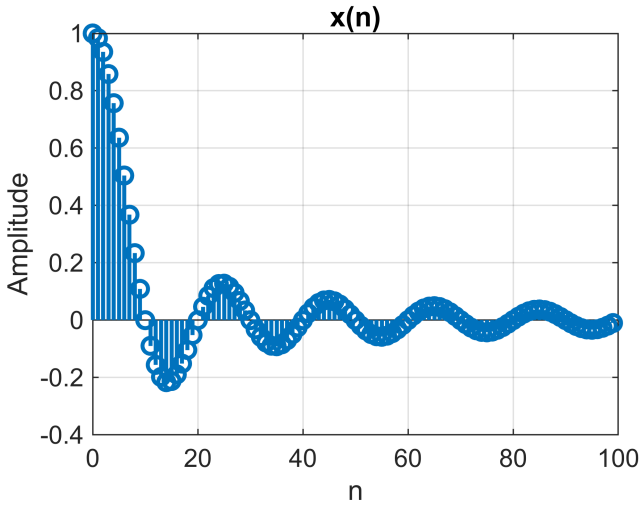
```
clear variables;
n = 0:19;
x_n = sin(0.2*n).*(n > 10);

figure, stem(n, x_n, 'LineWidth', 1.5), grid,
title('x(n)'), xlabel('n'), ylabel('Amplitude');
```



Ex 5) Să se reprezinte grafic secvența de lungime 100

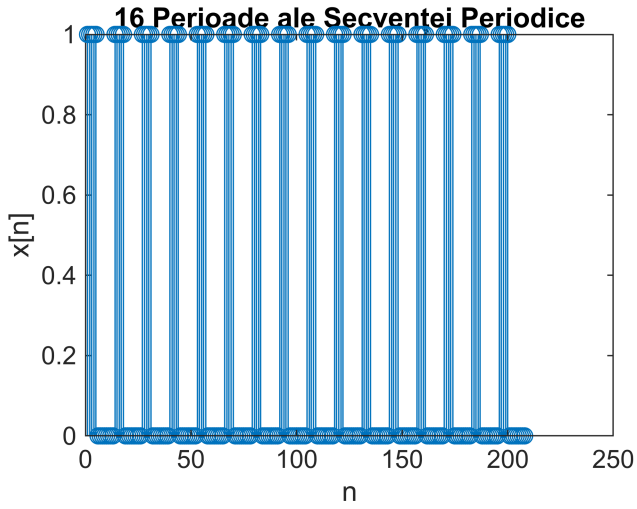
$$x(n) = \begin{cases} \dfrac{\sin(0.1n)}{0.1n}, & n \neq 0 \\ 1, & n = 10 \end{cases}, n \in \mathbb{N}.$$

```
clear variables;
n = 1:99;
x_n = [1 sinc(0.1*n)]; % sinc(x) = sin(πx) / (πx)
m = 0:99;

figure, stem(m, x_n, 'LineWidth', 1.5), grid,
title('x(n)'), xlabel('n'), ylabel('Amplitude');
```



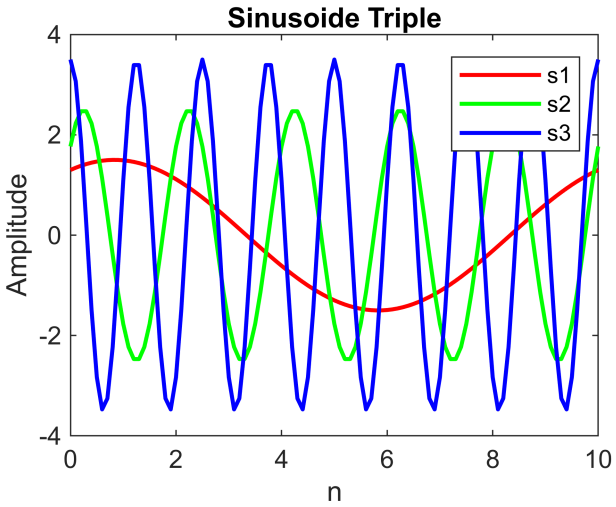
Ex 6) Să se genereze 16 perioade ale unei secvențe periodice, a cărei perioadă conține 5 eșantioane de 1 urmate de 8 eșantioane de 0.

```
clear variables;
perioada = [ones(1, 5), zeros(1, 8)];
secv_periodica = repmat(perioada, 1, 16);

figure, grid, stem(secv_periodica),
xlabel('n');
ylabel('x[n]');
title('16 Perioade ale Secvenței Periodice');
```



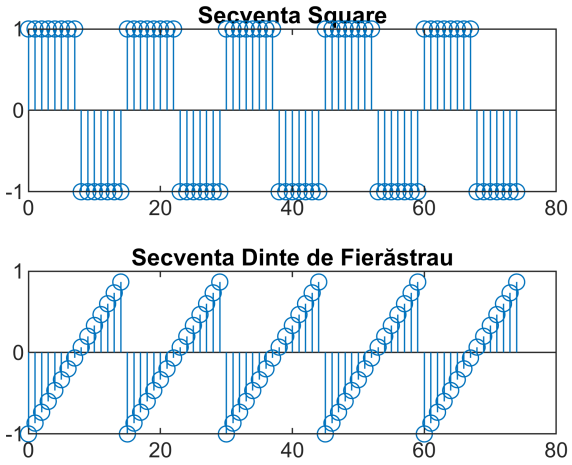
Ex 7) Să se genereze 3 secvențe sinusoidale cu amplitudini, frecvențe și faze diferite, și să se reprezinte grafic simultan pe ecran (minim o perioadă).

```
clear variables;
n = 0:0.1:10; % intervalul de timp, t

% param. pt cele 3 sinusuri
A = [1.5 2.5 3.5];
f = [0.1 0.5 0.8];
faza = [pi/3 pi/4 pi/2];

% Generarea semnalelor sinusoidale
s1 = A(1)*sin(2*pi*f(1)*n + faza(1));
s2 = A(2)*sin(2*pi*f(2)*n + faza(2));
s3 = A(3)*sin(2*pi*f(3)*n + faza(3));

figure,
plot(n, s1, 'r', 'LineWidth', 1.5), hold on,
plot(n, s2, 'g', 'LineWidth', 1.5), hold on,
plot(n, s3, 'b', 'LineWidth', 1.5),
hold off;

title('Sinusoide Triple'),
xlabel('n'), ylabel('Amplitude')
legend('s1', 's2', 's3');
```



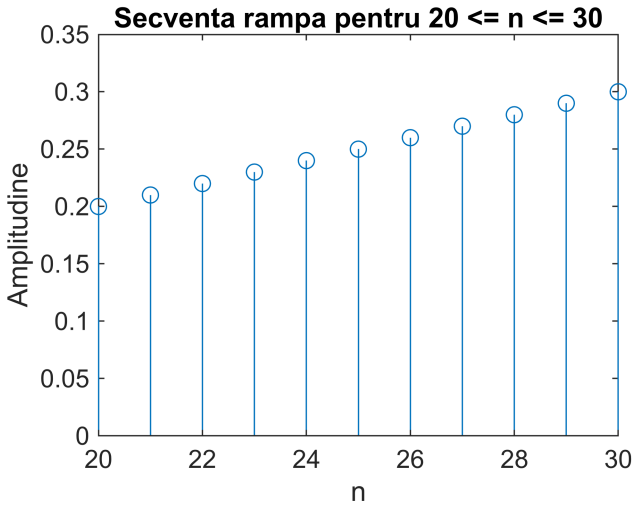
Ex 8) Să se genereze și să se reprezinte grafic 5 perioade corespunzătoare unei secvențe rectangulare ('square') și, respectiv, dinte de fierăstrău ('sawtooth'), având 15 eșantioane pe perioadă.

```
clear variables;

% "square" si "sawtooth" generează semnale discrete în timp => stem
n = 0:74; % 15 esant => 5*15 = 75
f = 1/15;

square_seq = square(2*pi*f*n);
sawtooth_seq = sawtooth(2*pi*f*n);

figure, grid
hold on
subplot(211); stem(n, square_seq)
title('Secventa Square')

subplot(212); stem(n, sawtooth_seq)
title('Secventa Dinte de Fierăstrau')
hold off
```



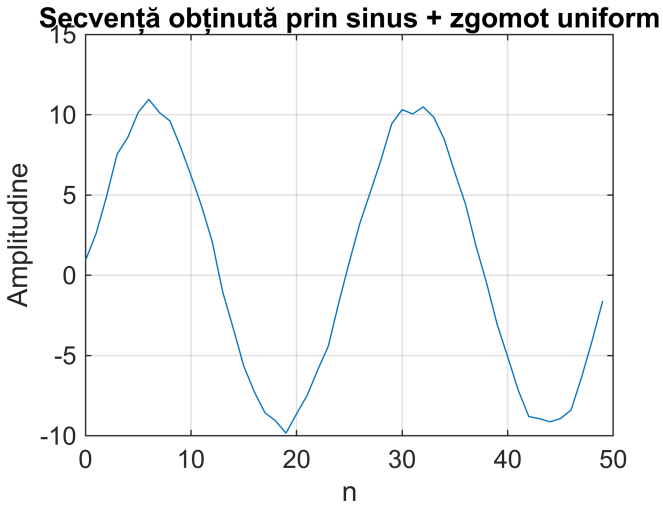
Ex 9) Să se genereze o secvență rampă, de lungime 101, cu valoare inițială 0 și increment 0.01. Să se reprezinte secvența pentru $20 \leq n \leq 30$.

```
clear variables;
n = 0:0.01:100;

x(1) = 0;
for i = 1:100
    x(i+1) = x(i) + 0.01;
end

figure, stem(20:30, x(21:31));
title('Secventa rampa pentru 20 <= n <= 30'),
xlabel('n'), ylabel('Amplitudine');
```



Ex 10) Să se reprezinte grafic secvența obținută prin însumarea unei sinusoide cu un zgomot uniform, cu amplitudinea de 10 ori mai mică.

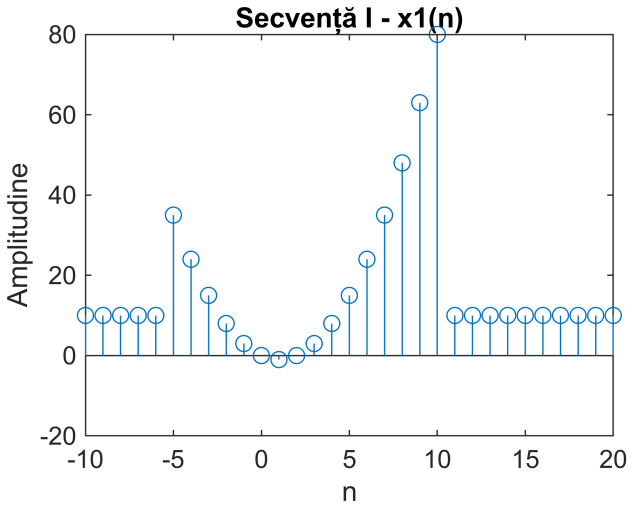
```
clear variables;
n = 0:49;
A = 10;
f = 1/25;
x = A*sin(2*pi*f*n);

zg = A/10 * rand(1, length(n));
y = x + zg;

figure, plot(n, y), grid,
title('Secvență obținută prin sinus + zgomot uniform'),
xlabel('n'), ylabel('Amplitudine');
```



Ex 11) Să se genereze și să se reprezinte grafic următoarele secvențe

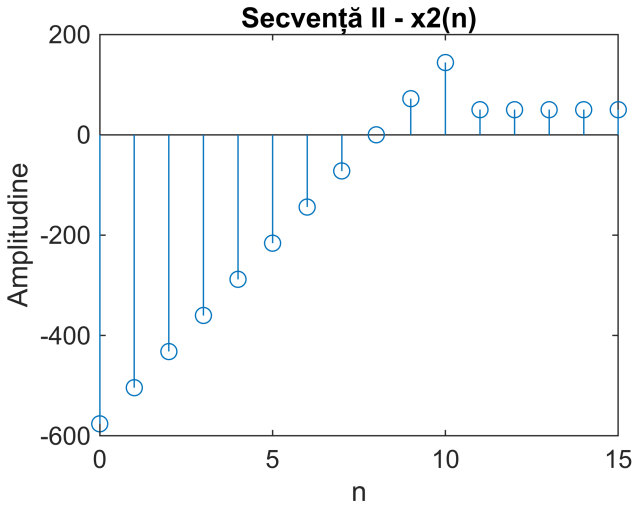
$$x_1(n) = \begin{cases} n(n-2), & n = \overline{-5, 10} \\ 10, & \text{în rest} \end{cases}, \quad n = \overline{-10, 20}$$

```
clear variables;
n = -10:20;
% x1_n = zeros(size(n));
for i = 1:length(n)
    if (n(i) >= -5 && n(i) <= 10)
        x1_n(i) = n(i)*(n(i)-2);
    else
        x1_n(i) = 10;
    end
end
figure, grid, stem(n, x1_n),
title('Secvență I - x1(n)')
xlabel('n'), ylabel('Amplitudine')
```



$$x_2(n) = \begin{cases} \sum_{i=0}^{8} a(n-2i), & n = \overline{0,10} \\ 50, & \text{în rest} \end{cases}, \; n = \overline{0,15}; \qquad a = \begin{cases} n+3, & n = \overline{0,5} \\ 0.5, & \text{în rest} \end{cases}$$

```
clear variables;
n = 0:15;
n_a = 0:5;

for k = 1:length(n_a)
    if(n(k) >= 0 && n(k) <= 5)
        a = n(k) + 3;
    else
        a = 0.5;
    end
end

for i = 1:length(n)
    if (n(i) >= 0 && n(i) <= 10)
        syms j; %simbol matematic
        f = a.*(n(i)-2*j);
        % symsum(f, j, 0, 8) - suma lui f de la 0 la 8
        x2_n(i)= symsum(f, j, 0, 8); % x2_n(i)= double(subs(symsum(f, j, 0, 8), j,
0));
    else
        x2_n(i) = 50;
    end
end
figure, grid, stem(n, x2_n)
title('Secvență II - x2(n)')
xlabel('n'), ylabel('Amplitudine')
```



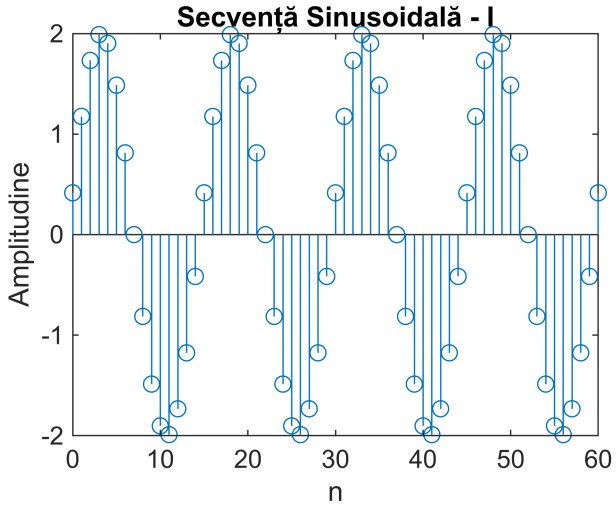
Ex 12) Să se scrie o funcție MATLAB pentru a genera valorile corespunzătoare unei secvențe sinusoidale de lungime finită. Funcția trebuie să aibă 5 argumente de intrare: 3 pentru parametrii sinusoidei și 2 pentru a specifica domeniul temporal. Sinusoida trebuie și afișată grafic.

• function x = Sinusoida(A, f, fi, nl, nu)

Să se apeleze funcția, considerând parametrii:

- $A = 2, f = \frac{1}{15}, \varphi = \frac{\pi}{5}, n = \overline{0,60}$

```
clear variables;
A = 2;
f = 1/15;
fi = pi/15;
nl = 0;
nu = 60;

Sinusoida(A, f, fi, nl, nu);
```



```
%function [x, n] = Sinusoida(A, f, phi, ni, ns)
%    n = nl:nu; % Domeniu Timp
%    x = A * sin(2*pi*f*n + phi);
%
%    figure, grid
%    stem(n, x);
%    title('Secvență Sinusoidală - II');
%    xlabel('n'), ylabel('Amplitudine');
%end
```

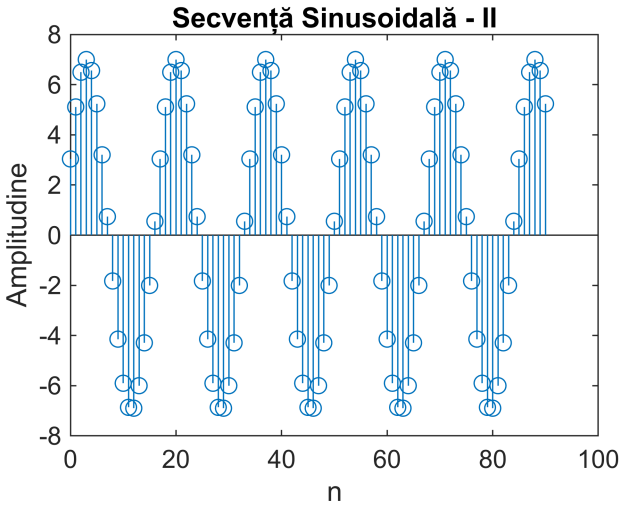
Ex 13) Să se modifce funcția anterioară, astfel încât să returneze și un vector care conține indecșii sinusoidei.

• function [x, n] = Sinusoida1(A, f, fi, nl, nu)

Să se apeleze funcția, considerând parametrii:

$$A = 7, f = \frac{1}{17}, \varphi = \frac{\pi}{7}, n = \overline{0,90}.$$

```
clear variables;
A = 7;
f = 1/17;
fi = pi/7;
nl = 0;
no = 90;

[S, N] = Sinusoida1(A, f, fi, nl, no);
```




```
Indicii sinusoidei:      0     1     2     3     4     5     6     7     8     9    10    11    12    13    14    15
```

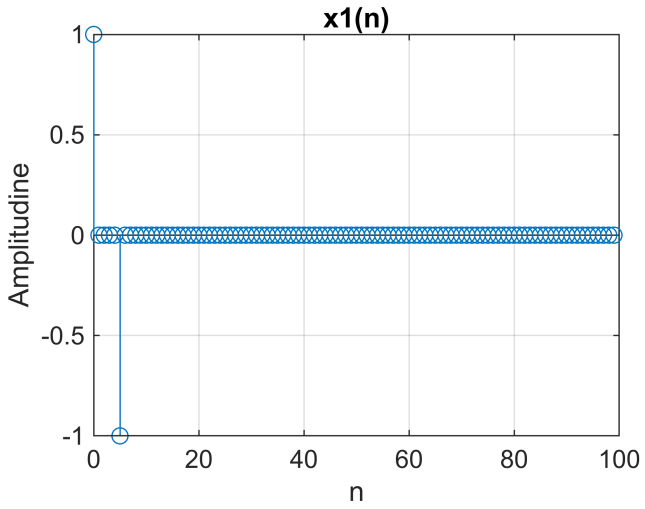
```
%function [x, n] = Sinusoida1(A, f, fi, nl, nu)
%    n = nl:nu; % Domeniu Timp
%    x = A * sin(2*pi*f*n + fi);
%
%    figure, grid
```

```
%    stem(n, x);
%    title('Secvență Sinusoidală - II');
%    xlabel('n'), ylabel('Amplitudine');
%
%    indices = nl:nu;
%
%    fprintf('Indicii sinusoidei: ');
%    disp(indices);
%end
```

Ex 14) Să se genereze și să se reprezinte grafic secvențele de lungime 100:

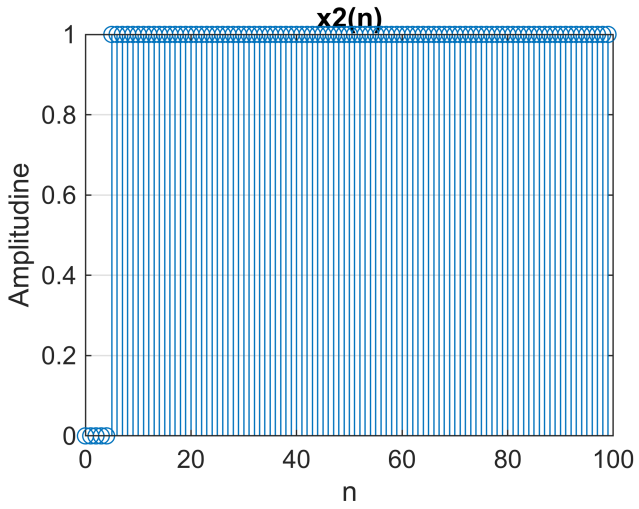
$$x_1(n) = \delta(n) - \delta(n-5);$$

```
clear variables;
n = 0:99;
x1_n = 1*(n==0)-1*(n==5);

figure, stem(n, x1_n), grid,
title('x1(n)'),
xlabel('n'), ylabel('Amplitudine');
```



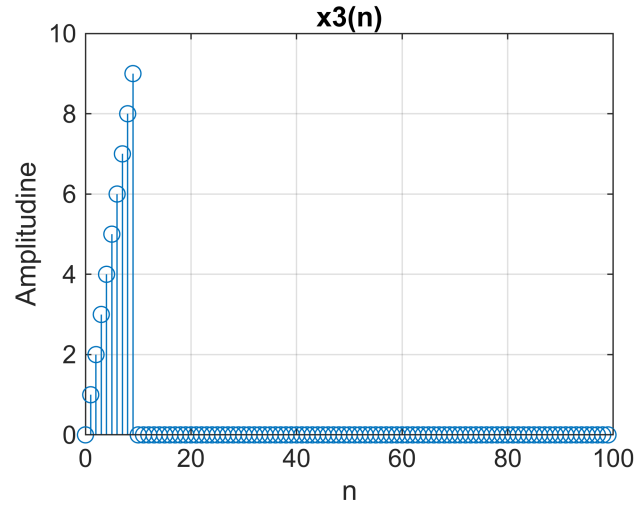
$$x_2(n) = u(n-5);$$

```
clear variables;
n = 0:99;
x2_n = 1.*(n>=5);
figure, stem(n, x2_n), grid,
title('x2(n)'),
xlabel('n'), ylabel('Amplitudine');
```



$$x_3(n) = n[u(n) - u(n-10)];$$

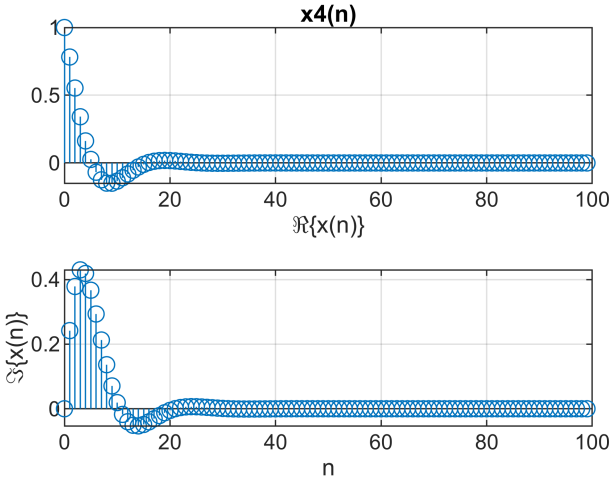
```
clear variables;
n = 0:99;
x3_n = n.*(1*(n>=0)-1*(n>=10));

figure, stem(n, x3_n), grid,
title('x3(n)'),
xlabel('n'), ylabel('Amplitudine');
```



$$x_4(n) = \exp[(-0.2 + j0.3)n];$$

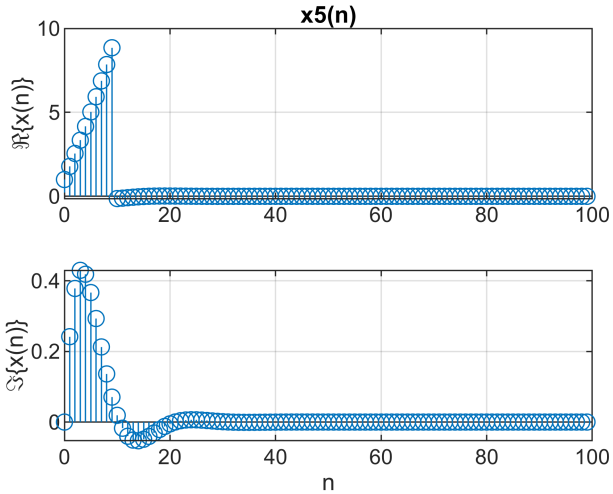
```
clear variables;
n = 0:99;
x4_n = exp((-0.2+j*0.3)*n);
x4_n_real = real(x4_n);
x4_n_imag = imag(x4_n);
```

```
figure,
subplot(211); stem(n, x4_n_real), grid,
title('x4(n)'), xlabel('\Re\{x(n)\}'),
subplot(212); stem(n, x4_n_imag), grid,
xlabel('n'), ylabel('\Im\{x(n)\}');
```



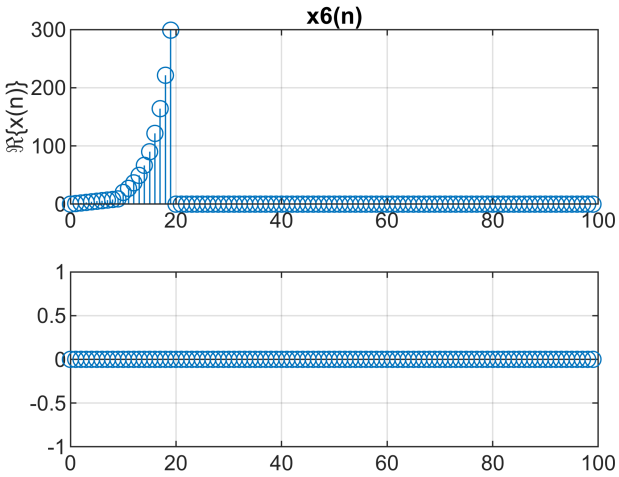
$$x_5(n) = n[u(n) - u(n-10)] + \exp[(-0.2 + j0.3)n];$$

```
clear variables;
n = 0:99;
x5_n = n.*(1*(n>=0)-1*(n>=10))+exp((-0.2+j*0.3)*n);
x5_n_real = real(x5_n);
x5_n_imag = imag(x5_n);

figure,
subplot(211), stem(n, x5_n_real), grid,
title('x5(n)'), ylabel('\Re\{x(n)\}'),
subplot(212), stem(n, x5_n_imag), grid,
xlabel('n'), ylabel('\Im\{x(n)\}');
```

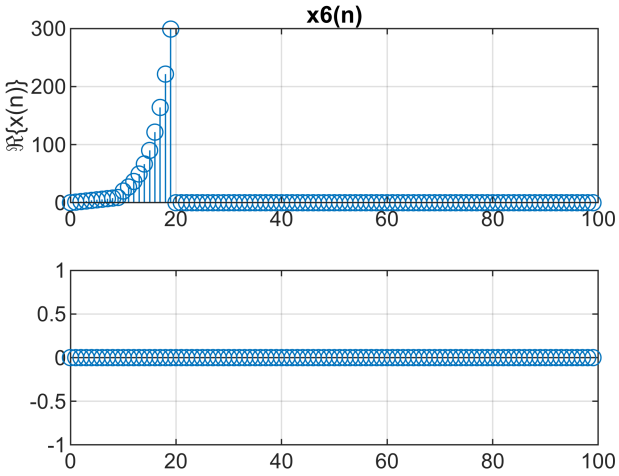


$$x_6(n) = n[u(n) - u(n-10)] + \exp(0.3n)[u(n-10) - u(n-20)]$$

```
clear variables;
n = 0:99;
x6_n = n.*(1*(n>=0)-1*(n>=10))+exp(0.3*n).*(1*(n>=10)-1*(n>=20));
x6_n_real = real(x6_n);
x6_n_imag = imag(x6_n);

figure,
subplot(211), stem(n, x6_n_real), grid,
title('x6(n)'), ylabel('\Re\{x(n)\}'),
subplot(212), stem(n, x6_n_imag), grid;
```



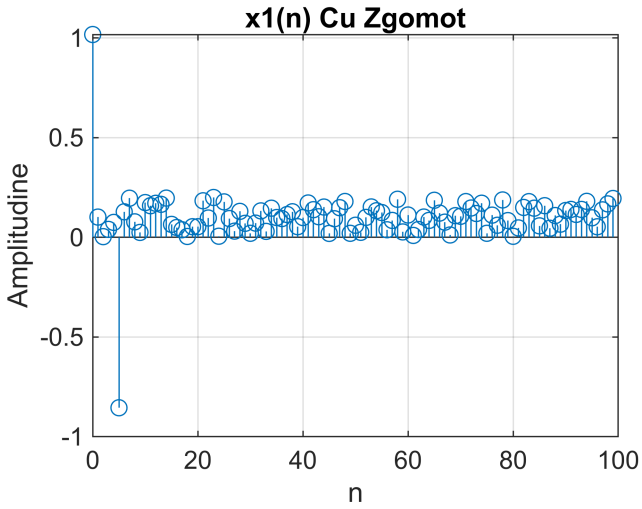

```
x6_n = n.*(1*(n>=0)-1*(n>=10))+exp(0.3*n).*(1*(n>=10)-1*(n>=20));
x6_n_real = real(x6_n);
x6_n_imag = imag(x6_n);

figure,
subplot(211), stem(n, x6_n_real), grid,
title('x6(n)'), ylabel('\Re\{x(n)\}'),
subplot(212), stem(n, x6_n_imag), grid;
```



Ex 15) Să se adauge un zgomot uniform cu medie 0 și amplitudine maximă 0.2, secvențelor de la exercițiul 14.

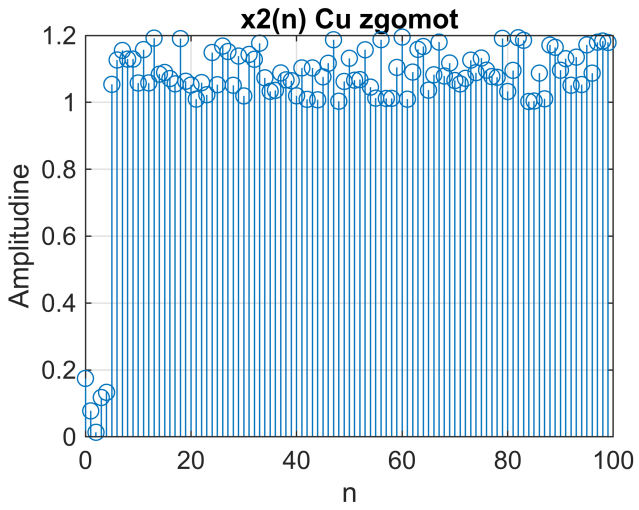
$$x_1(n) = \delta(n) - \delta(n-5);$$

```
clear variables;
n = 0:99;
x1_n = 1*(n==0)-1*(n==5);

a = 0; b = 0.2;
zg = a + (b - a)*rand(1, length(x1_n));
x1_n_zg = x1_n + zg;

figure, stem(n, x1_n_zg), grid,
title('x1(n) Cu Zgomot'),
xlabel('n'), ylabel('Amplitudine');
```



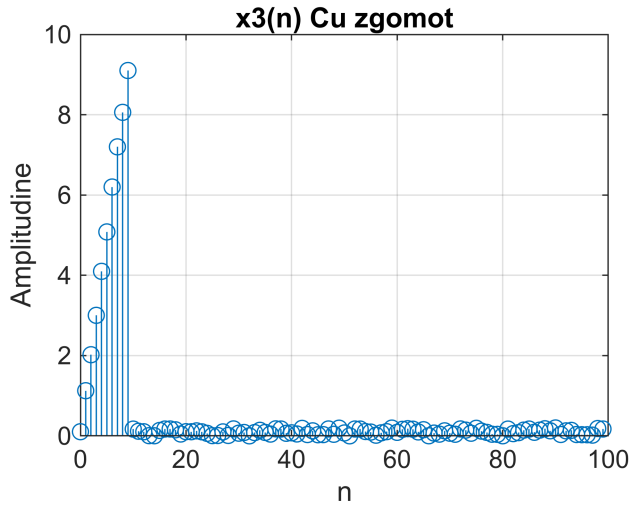
$$x_2(n) = u(n-5);$$

```
clear variables;
n = 0:99;
x2_n = 1.*(n>=5);

a = 0; b = 0.2;
zg = a + (b - a)*rand(1, length(x2_n));
x2_n_zg = x2_n + zg;

figure, stem(n, x2_n_zg), grid,
title('x2(n) Cu zgomot'),
xlabel('n'), ylabel('Amplitudine');
```



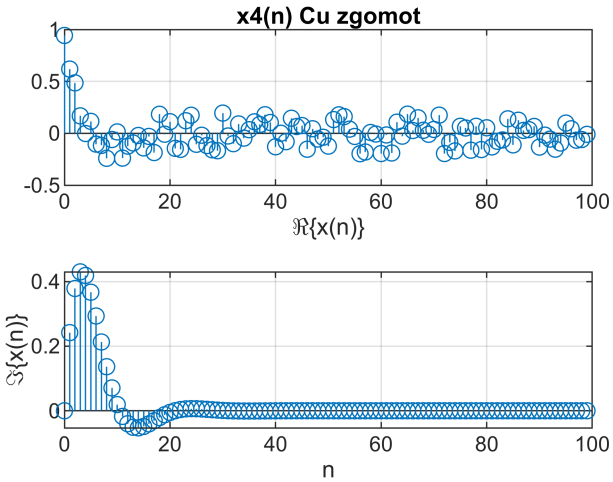
$$x_3(n) = n[u(n) - u(n-10)];$$

```
clear variables;
n = 0:99;
x3_n = n.*(1*(n>=0)-1*(n>=10));

a = 0; b = 0.2;
zg = a + (b - a)*rand(1, length(x3_n));
x3_n_zg = x3_n + zg;

figure, stem(n, x3_n_zg), grid,
title('x3(n) Cu zgomot'),
xlabel('n'), ylabel('Amplitudine');
```



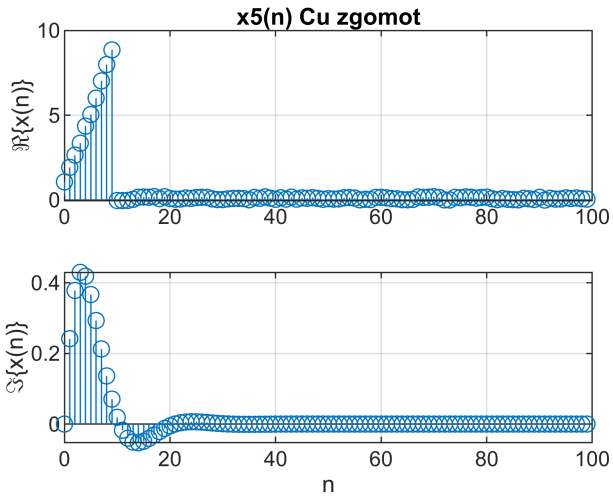
$$x_4(n) = \exp[(-0.2 + j0.3)n];$$

```
clear variables;
n = 0:99;
x4_n = exp((-0.2+1j*0.3)*n);

a = 0; b = 0.2;
zg = a + (b - a)*(2*rand(1, length(x4_n)) - 1);
x4_n_zg = x4_n + zg;
x4_n_real_zg = real(x4_n_zg);
x4_n_imag_zg = imag(x4_n_zg);

figure,
subplot(211); stem(n, x4_n_real_zg), grid on;
title('x4(n) Cu zgomot'), xlabel('\Re\{x(n)\}'),
subplot(212); stem(n, x4_n_imag_zg), grid,
xlabel('n'), ylabel('\Im\{x(n)\}');
```



$$x_5(n) = n[u(n) - u(n-10)] + \exp[(-0.2 + j0.3)n];$$

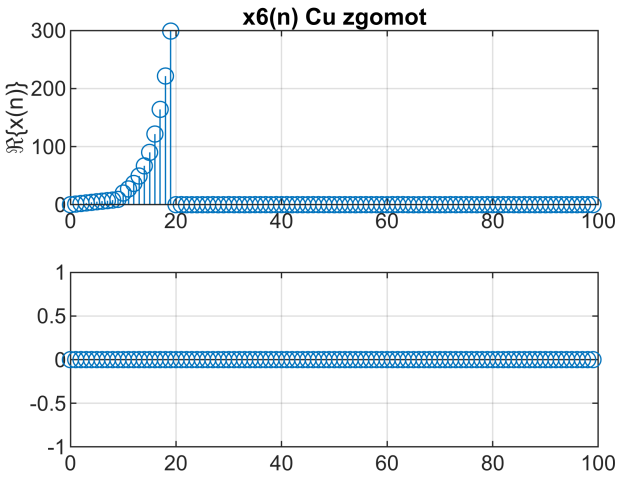
```
clear variables;
n = 0:99;
x5_n = n.*(1*(n>=0)-1*(n>=10))+exp((-0.2+j*0.3)*n);

a = 0; b = 0.2;
zg = a + (b - a)*rand(1, length(x5_n));
x5_n_zg = x5_n + zg;
x5_n_real_zg = real(x5_n_zg);
x5_n_imag_zg = imag(x5_n_zg);

figure,
subplot(211), stem(n, x5_n_real_zg), grid,
title('x5(n) Cu zgomot'), ylabel('\Re\{x(n)\}'),
subplot(212), stem(n, x5_n_imag_zg), grid,
xlabel('n'), ylabel('\Im\{x(n)\}');
```



$$x_6(n) = n[u(n) - u(n-10)] + \exp(0.3n)[u(n-10) - u(n-20)]$$

```
clear variables;
n = 0:99;
x6_n = n.*(1*(n>=0)-1*(n>=10))+exp(0.3*n).*(1*(n>=10)-1*(n>=20));

a = 0; b = 0.2;
zg = a + (b - a)*rand(1, length(x6_n));
x6_n_zg = x6_n + zg;
x6_n_real_zg = real(x6_n_zg);
x6_n_imag_zg = imag(x6_n_zg);

figure,
subplot(211), stem(n, x6_n_real_zg), grid,
title('x6(n) Cu zgomot'), ylabel('\Re\{x(n)\}'),
```

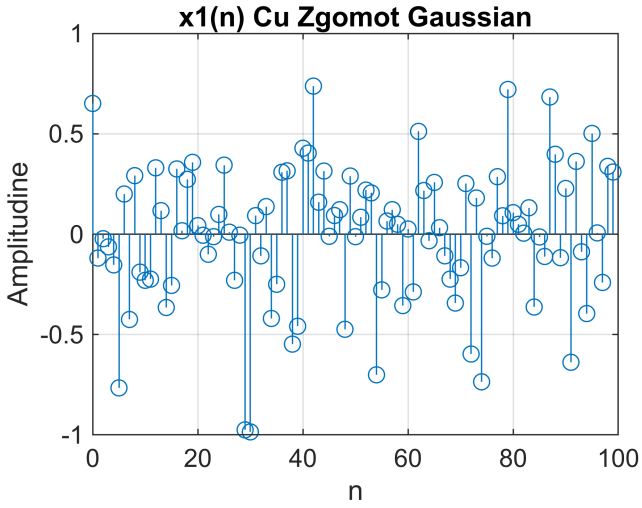
```
subplot(212), stem(n, x6_n_imag_zg), grid;
```



Ex 16) Să se adauge un zgomot Gaussian cu medie 0 și varianță 0.1, secvențelor de la exercițiul 14.

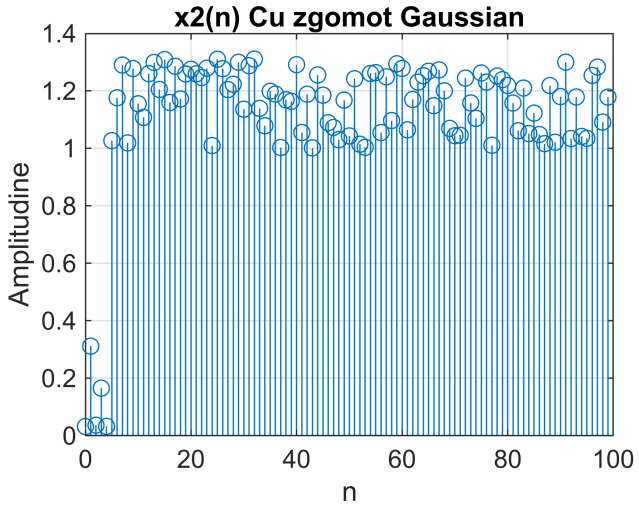
$$x_1(n) = \delta(n) - \delta(n-5);$$

```
clear variables;
n = 0:99;
x1_n = 1*(n==0)-1*(n==5);

a = 0; % medie
b = 0.1; % varianta
zg_gauss = a + sqrt(b)*randn(1, length(x1_n));
x1_n_zg = x1_n + zg_gauss;

figure, stem(n, x1_n_zg), grid,
title('x1(n) Cu Zgomot Gaussian'),
xlabel('n'), ylabel('Amplitudine');
```



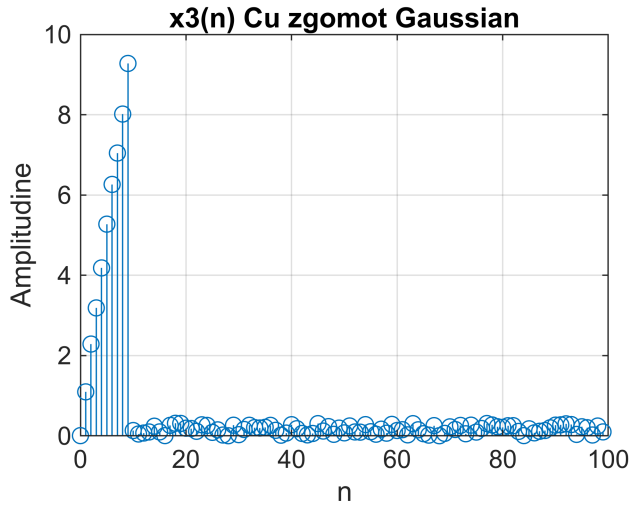
$x_2(n) = u(n-5);$

```
clear variables;
n = 0:99;
x2_n = 1.*(n>=5);

a = 0; b = 0.1;
zg_gauss = a + sqrt(b)*rand(1, length(x2_n));
x2_n_zg = x2_n + zg_gauss;

figure, stem(n, x2_n_zg), grid,
title('x2(n) Cu zgomot Gaussian'),
xlabel('n'), ylabel('Amplitudine');
```



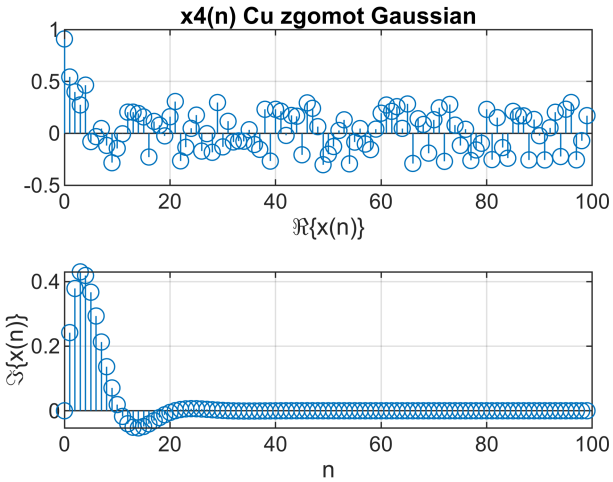
$x_3(n) = n[u(n) - u(n-10)];$

```
clear variables;
n = 0:99;
x3_n = n.*(1*(n>=0)-1*(n>=10));

a = 0; b = 0.1;
zg_gauss = a + sqrt(b)*rand(1, length(x3_n));
x3_n_zg = x3_n + zg_gauss;

figure, stem(n, x3_n_zg), grid,
title('x3(n) Cu zgomot Gaussian'),
xlabel('n'), ylabel('Amplitudine');
```



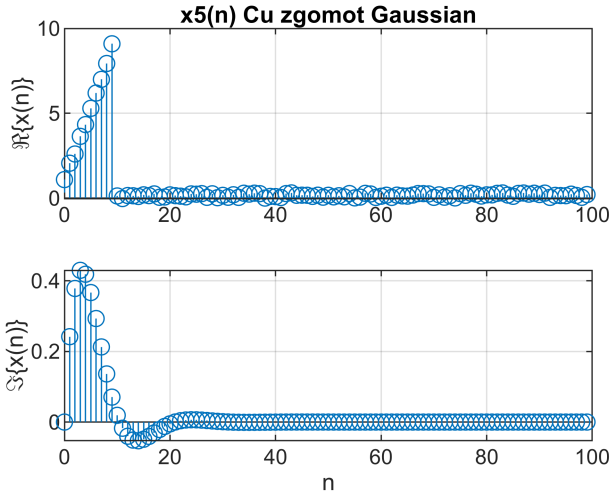
$$x_4(n) = \exp[(-0.2 + j0.3)n];$$

```
clear variables;
n = 0:99;
x4_n = exp((-0.2+1j*0.3)*n);

a = 0; b = 0.1;
zg_gauss = a + sqrt(b)*(2*rand(1, length(x4_n)) - 1);
x4_n_zg = x4_n + zg_gauss;
x4_n_real_zg = real(x4_n_zg);
x4_n_imag_zg = imag(x4_n_zg);

figure,
subplot(211); stem(n, x4_n_real_zg), grid on;
title('x4(n) Cu zgomot Gaussian'), xlabel('\Re\{x(n)\}'),
subplot(212); stem(n, x4_n_imag_zg), grid,
xlabel('n'), ylabel('\Im\{x(n)\}');
```



$$x_5(n) = n[u(n) - u(n-10)] + \exp[(-0.2 + j0.3)n];$$

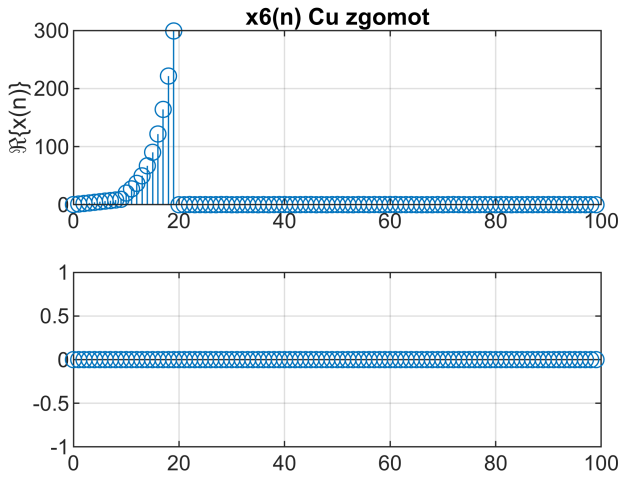
```
clear variables;
n = 0:99;
x5_n = n.*(1*(n>=0)-1*(n>=10))+exp((-0.2+j*0.3)*n);

a = 0; b = 0.1;
zg_gauss = a + sqrt(b)*rand(1, length(x5_n));
x5_n_zg = x5_n + zg_gauss;
x5_n_real_zg = real(x5_n_zg);
x5_n_imag_zg = imag(x5_n_zg);

figure,
subplot(211), stem(n, x5_n_real_zg), grid,
title('x5(n) Cu zgomot Gaussian'), ylabel('\Re\{x(n)\}'),
subplot(212), stem(n, x5_n_imag_zg), grid,
xlabel('n'), ylabel('\Im\{x(n)\}');
```



$$x_6(n) = n[u(n) - u(n-10)] + \exp(0.3n)[u(n-10) - u(n-20)]$$

```
clear variables;
n = 0:99;
x6_n = n.*(1*(n>=0)-1*(n>=10))+exp(0.3*n).*(1*(n>=10)-1*(n>=20));

a = 0; b = 0.1;
zg_gauss = a + sqrt(b)*rand(1, length(x6_n));
x6_n_zg = x6_n + zg_gauss;
x6_n_real_zg = real(x6_n_zg);
x6_n_imag_zg = imag(x6_n_zg);

figure,
subplot(211), stem(n, x6_n_real_zg), grid,
title('x6(n) Cu zgomot'), ylabel('\Re\{x(n)\}'),
```

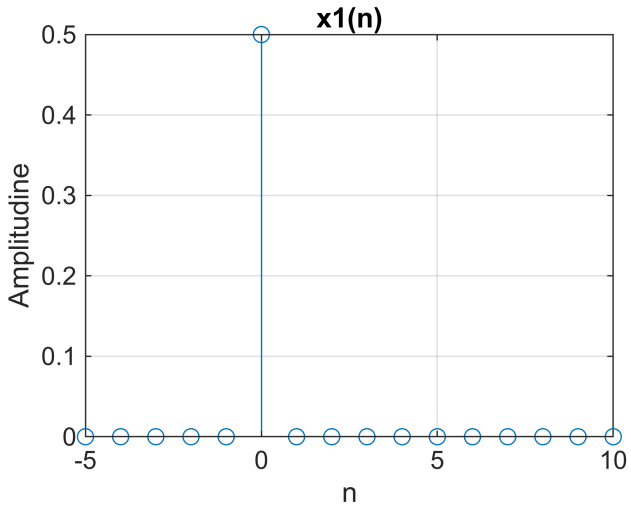
```
subplot(212), stem(n, x6_n_imag_zg), grid;
```



Ex 17) Să se genereze și să se reprezinte grafic următoarele secvențe. Abscisa n trebuie să includă doar domeniul indicat.

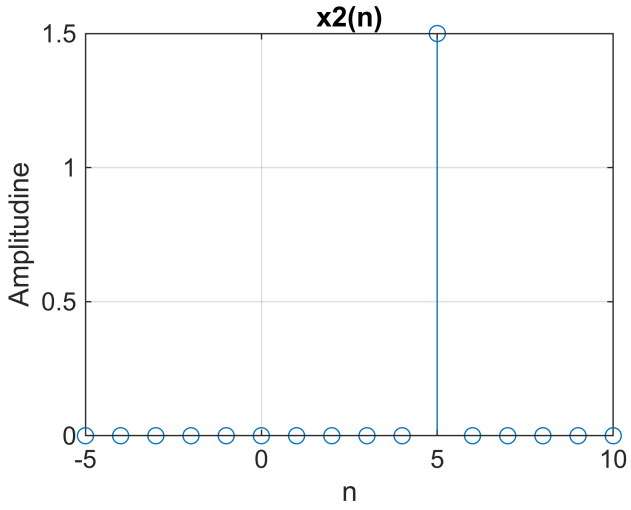
$$x_1(n) = 0.5\delta(n),\ n = \overline{-5, 10};$$

```
clear variables;
n = -5:10;

x1_n = 0.5.*(n == 0); % impuls unitate

figure, stem(n, x1_n), grid,
title('x1(n)');
xlabel('n'), ylabel('Amplitudine');
```



$$x_2(n) = 1.5\delta(n-5),\ n = \overline{-5, 10};$$

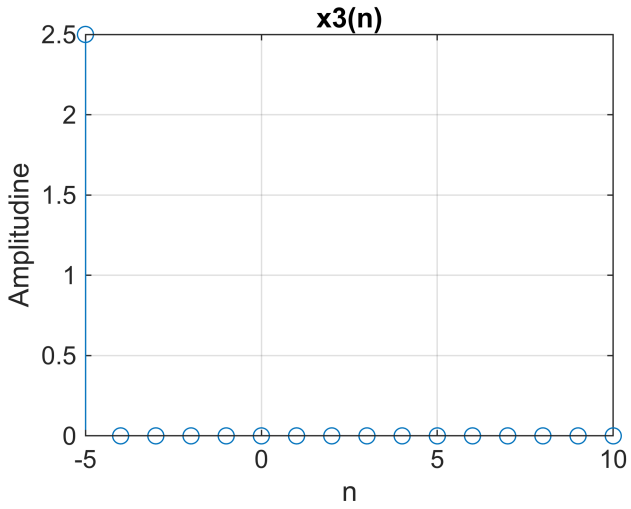
```
clear variables;
n = -5:10;
x2_n = 1.5.*ImpulsUnitate(n - 5);

figure, stem(n, x2_n), grid,
title('x2(n)'),
xlabel('n'), ylabel('Amplitudine');
```




```
% function y = ImpulsUnitate(n)
% y = (n == 0);
% end
```

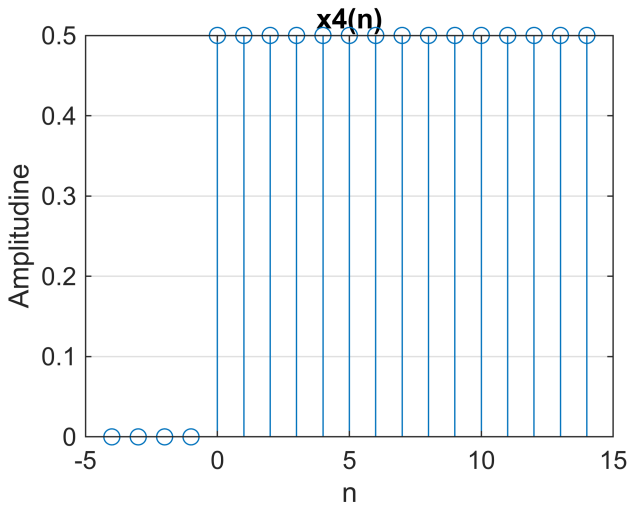
$$x_3(n) = 2.5\delta(n+5),\ n = \overline{-5, 10};$$

```
clear variables;
n = -5:10;
x3_n = 2.5.*ImpulsUnitate(n-(-5));

figure, stem(n, x3_n), grid,
title('x3(n)'),
xlabel('n'), ylabel('Amplitudine');
```



$$x_4(n) = 0.5u(n),\ n = \overline{-4, 14};$$

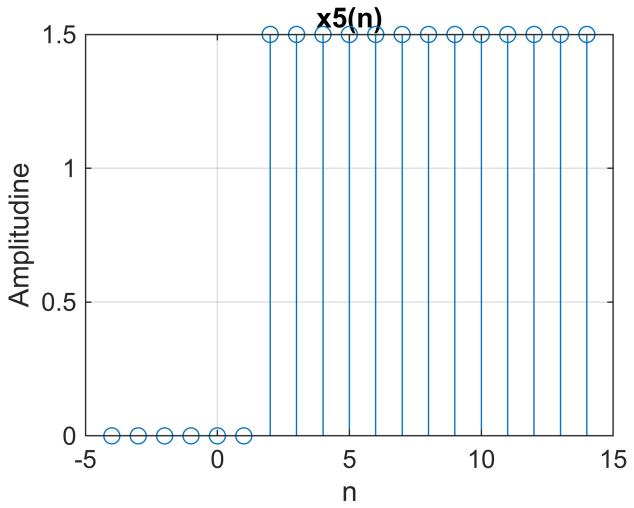
```
clear variables;
n = -4:14;
x4_n = 0.5.*(n >= 0);

figure, stem(n, x4_n), grid,
title('x4(n)'),
xlabel('n'), ylabel('Amplitudine');
```



$$x_5(n) = 1.5u(n-2),\ n = \overline{-4, 14};$$

```
clear variables;
n = -4:14;
x5_n = 1.5.*TreaptaUnitate(n - 2);
```

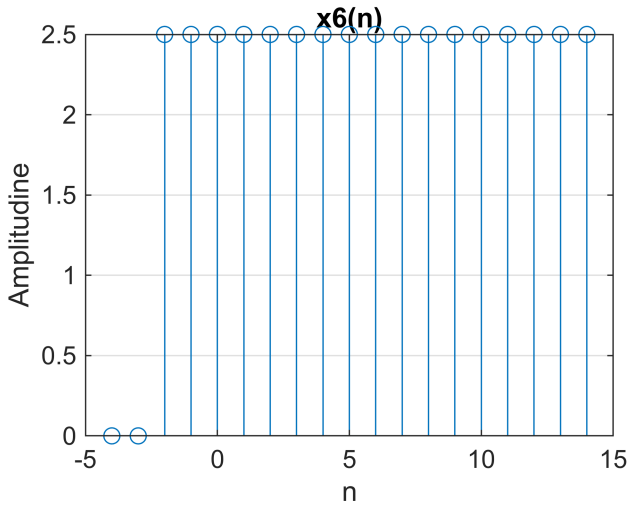
```
figure, stem(n, x5_n), grid,
title('x5(n)'),
xlabel('n'), ylabel('Amplitudine');
```




```
% function y = TreaptaUnitate(n)
% y = (n >= 0);
% end
```

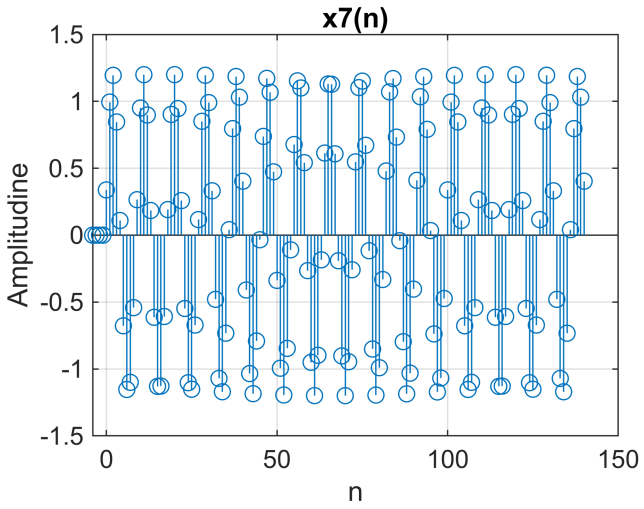
$$x_6(n) = 2.5u(n+2),\ n = \overline{-4, 14};$$

```
clear variables;
n = -4:14;
x6_n = 2.5.*TreaptaUnitate(n - (-2));

figure, stem(n, x6_n), grid,
title('x6(n)'),
xlabel('n'), ylabel('Amplitudine');
```



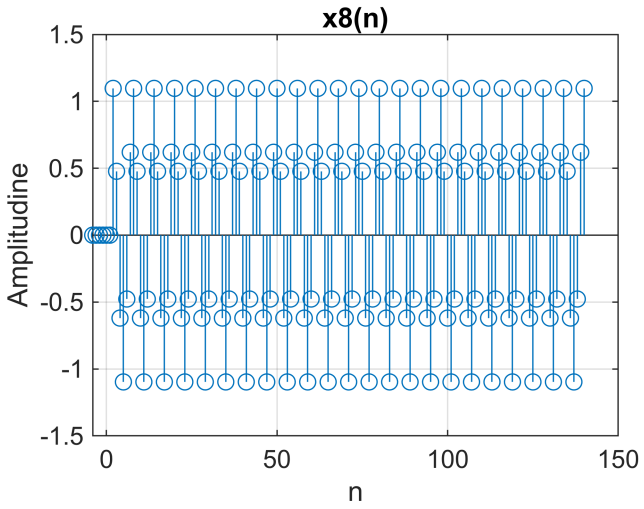
$$x_7(n) = 1.2\sin\left(2\pi 0.11n + \frac{\pi}{11}\right)u(n),\ n = \overline{-4, 140};$$

```
clear variables;
n = -4:140;
x7_n = 1.2*sin(2*pi*0.11*n + pi/11).*TreaptaUnitate(n);

figure, stem(n, x7_n), grid,
title('x7(n)'),
xlabel('n'), ylabel('Amplitudine');
```



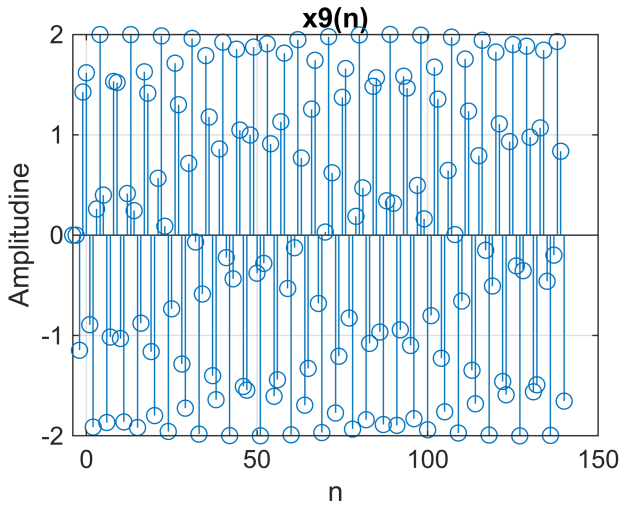
$$x_8(n) = 1.1\sin\left(\frac{\pi n}{3} - \frac{\pi}{7}\right)u(n-2),\ n = \overline{-4, 140};$$

```
clear variables;
n = -4:140;
x8_n = 1.1*sin((pi*n)/3 - pi/7).*TreaptaUnitate(n - 2);

figure, stem(n, x8_n), grid,
title('x8(n)'),
xlabel('n'), ylabel('Amplitudine');
```



$$x_9(n) = 2\cos\left(\frac{\pi n}{\sqrt{5}} + \frac{\pi}{5}\right)u(n+2),\ n = \overline{-4, 140};$$

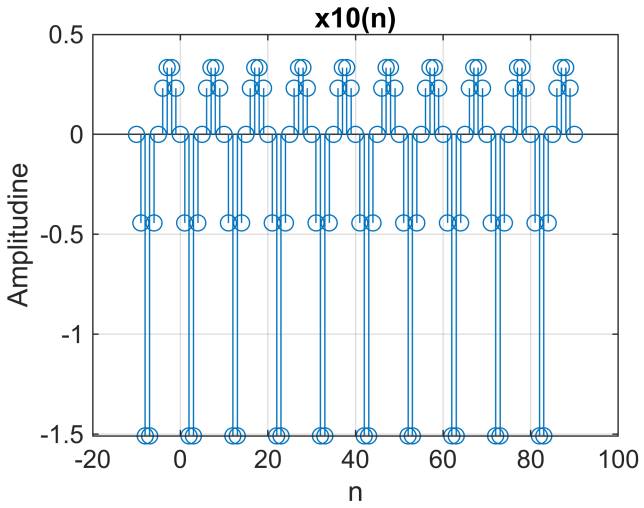
```
clear variables;
n = -4:140;
x9_n = 2*cos((pi*n)/sqrt(5) + pi/5).*TreaptaUnitate(n - (-2));

figure, stem(n, x9_n), grid,
title('x9(n)'),
xlabel('n'), ylabel('Amplitudine');
```



$$x_{10}(n) = \ln\left|\sin\left(\frac{\pi n}{10}\right) - \cos\left(\frac{\pi n}{10}\right)\right|,\ n = \overline{-10, 90};$$

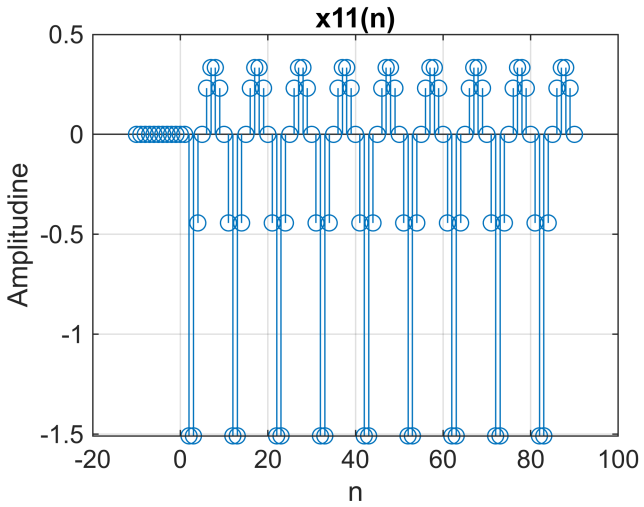
```
clear variables;
```

```
n = -10:90;
x10_n = log(abs(sin((pi*n)/10) - cos((pi*n)/10)));

figure, stem(n, x10_n), grid,
title('x10(n)'),
xlabel('n'), ylabel('Amplitudine');
```



$$x_{11}(n) = \ln\left|\sin\left(\frac{\pi n}{10}\right) - \cos\left(\frac{\pi n}{10}\right)\right| u(n-2),\ n = \overline{-10, 90};$$

```
clear variables;
n = -10:90;
x11_n = log(abs(sin((pi*n)/10) - cos((pi*n)/10))).*TreaptaUnitate(n - 2);

figure, stem(n, x11_n), grid,
title('x11(n)'),
xlabel('n'), ylabel('Amplitudine');
```



$$x_{12}(n) = \ln\left|\sin\left(\frac{\pi n}{10}\right) - \cos\left(\frac{\pi n}{10}\right)\right| u(n+2),\ n = \overline{-10, 90}$$

```
clear variables;
n = -10:90;
x12_n = log(abs(sin((pi*n)/10) - cos((pi*n)/10))).*TreaptaUnitate(n - (-2));

figure, stem(n, x12_n), grid,
title('x12(n)'),
xlabel('n'), ylabel('Amplitudine');
```