Aula 07 – janelamento e zero padding

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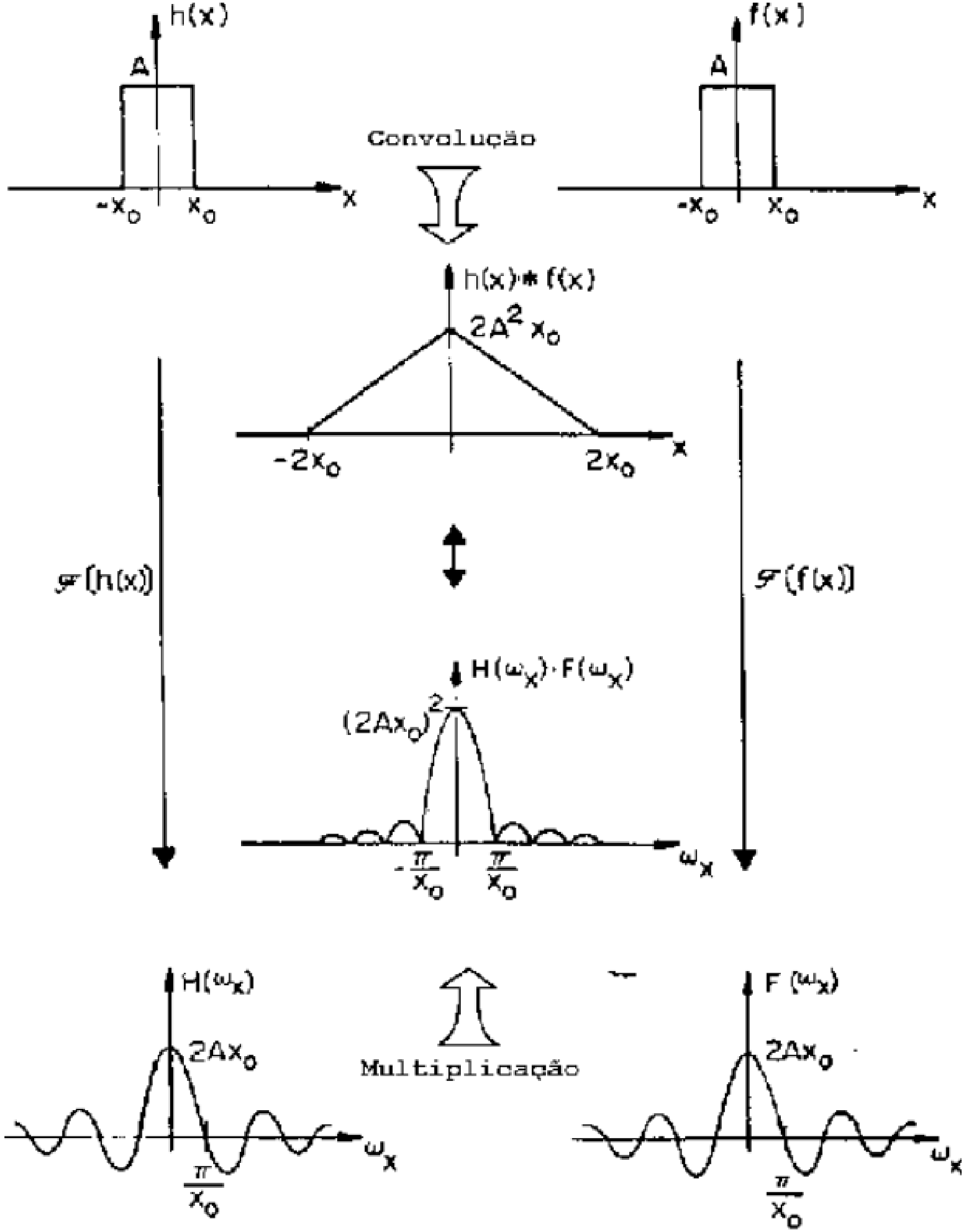
Processamentos de sinais

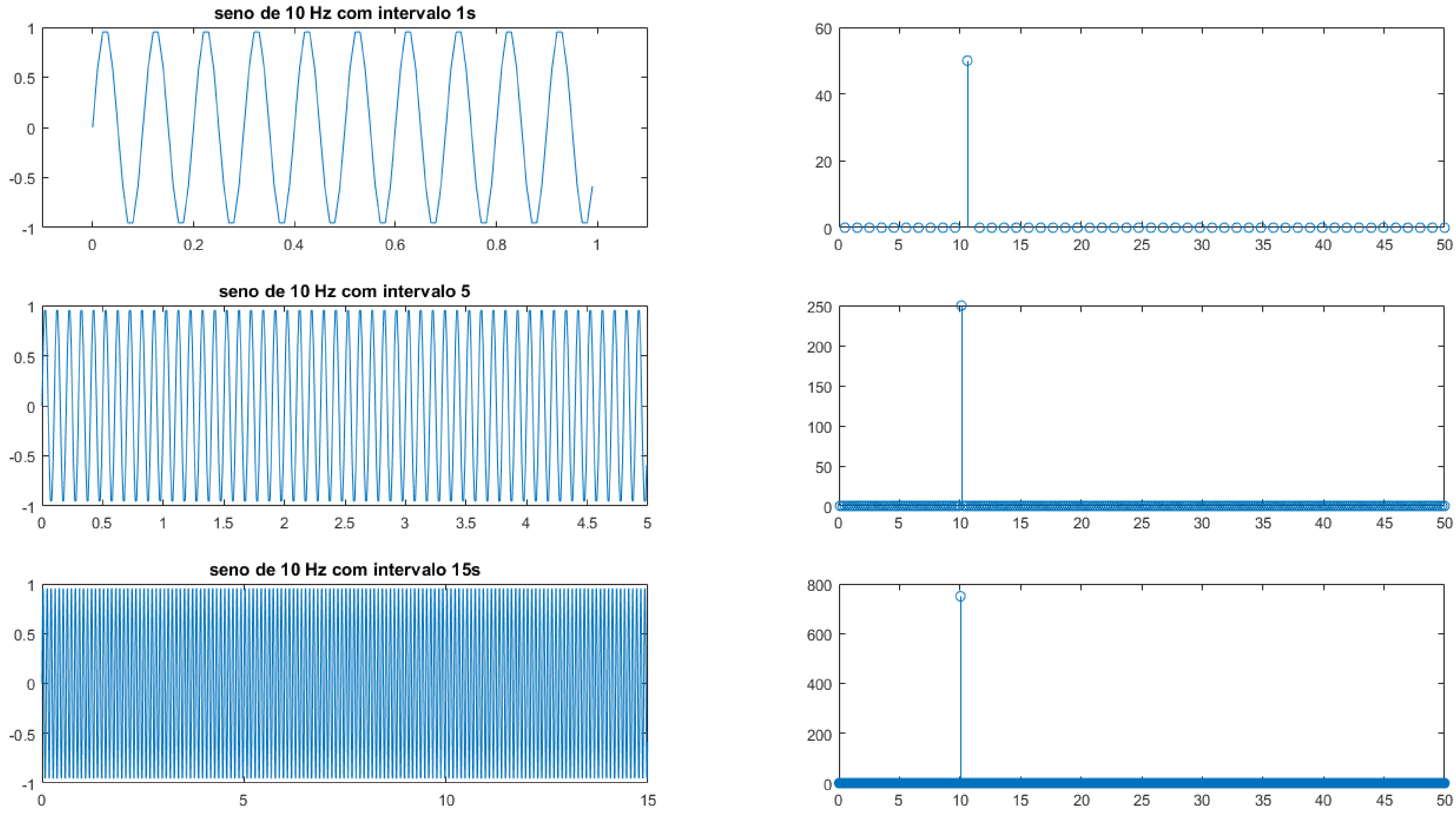
Teorema da convolução

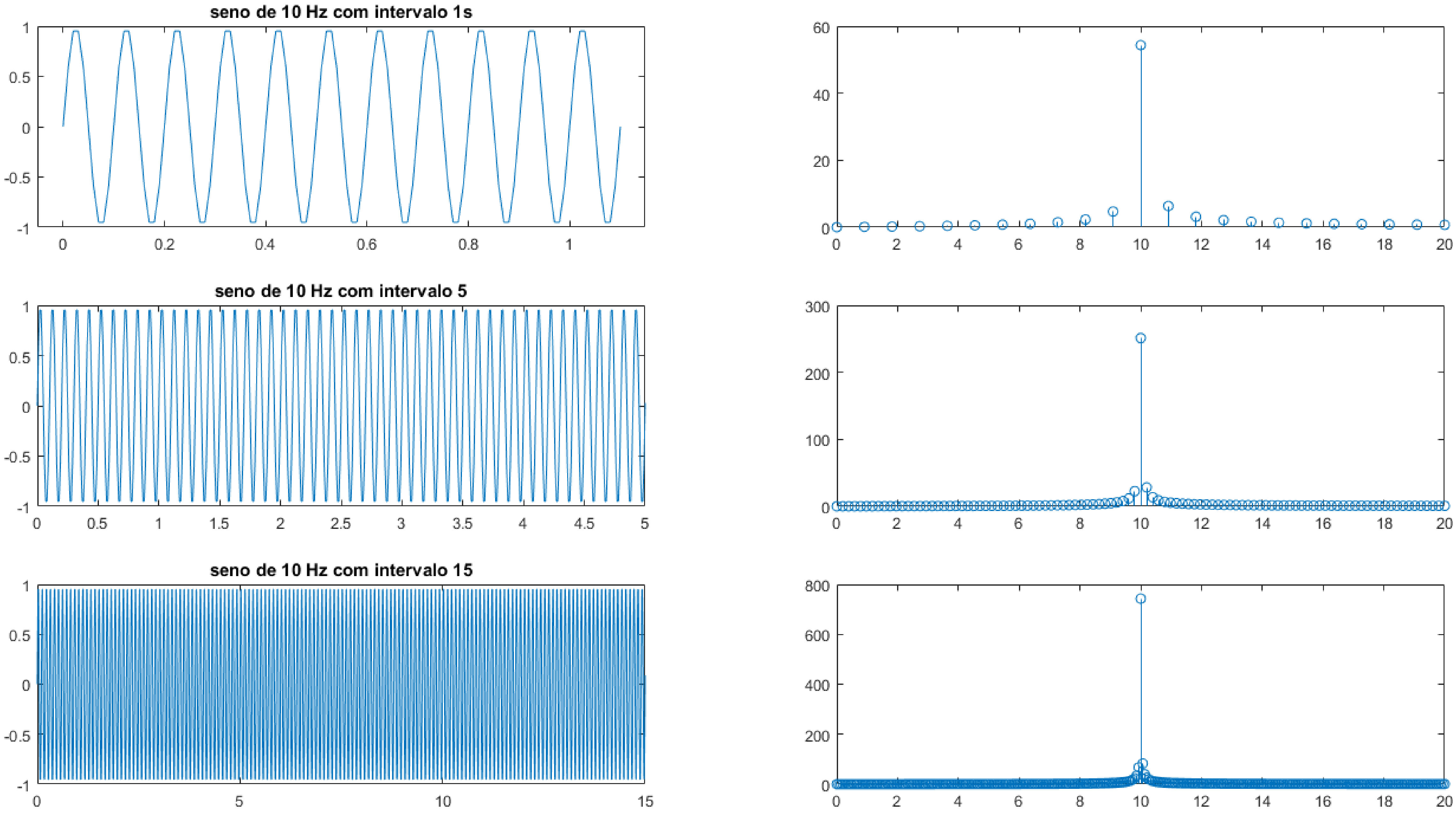
Convolução:

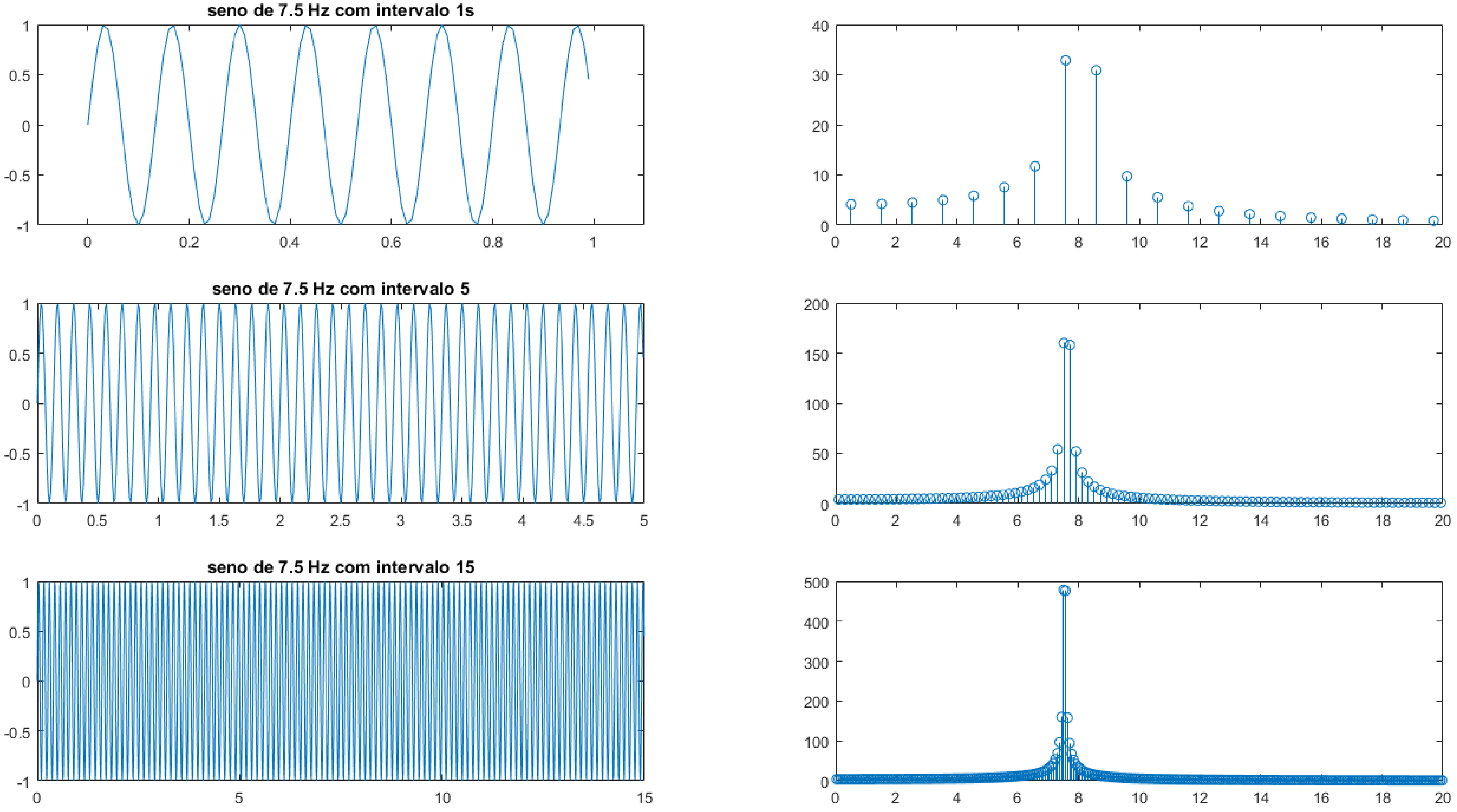
$$s(t)\times h(t) \Leftrightarrow S(\omega)*H(\omega)$$

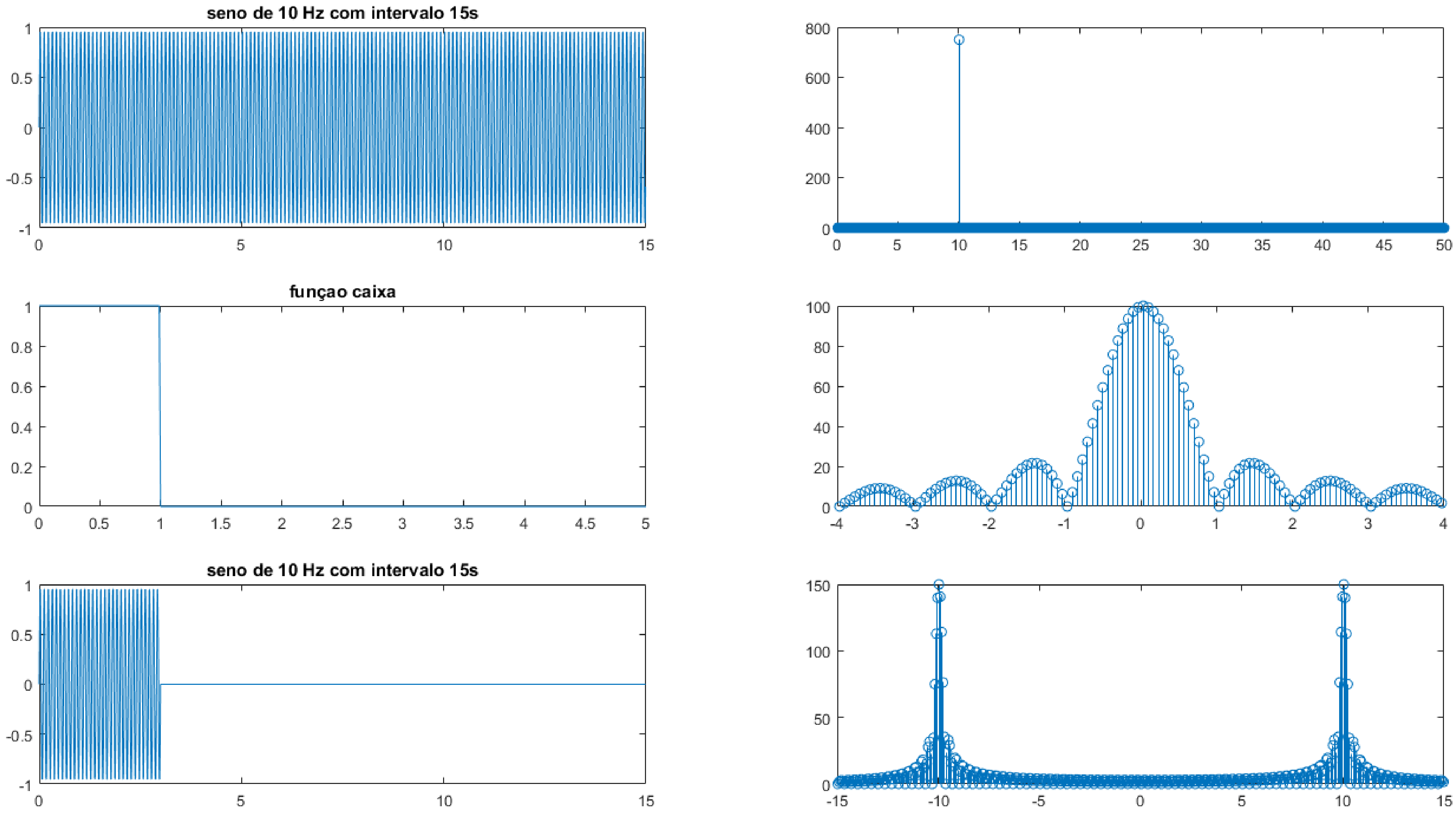
$$S(\omega)\times H(\omega) \Leftrightarrow s(t)*h(t)$$

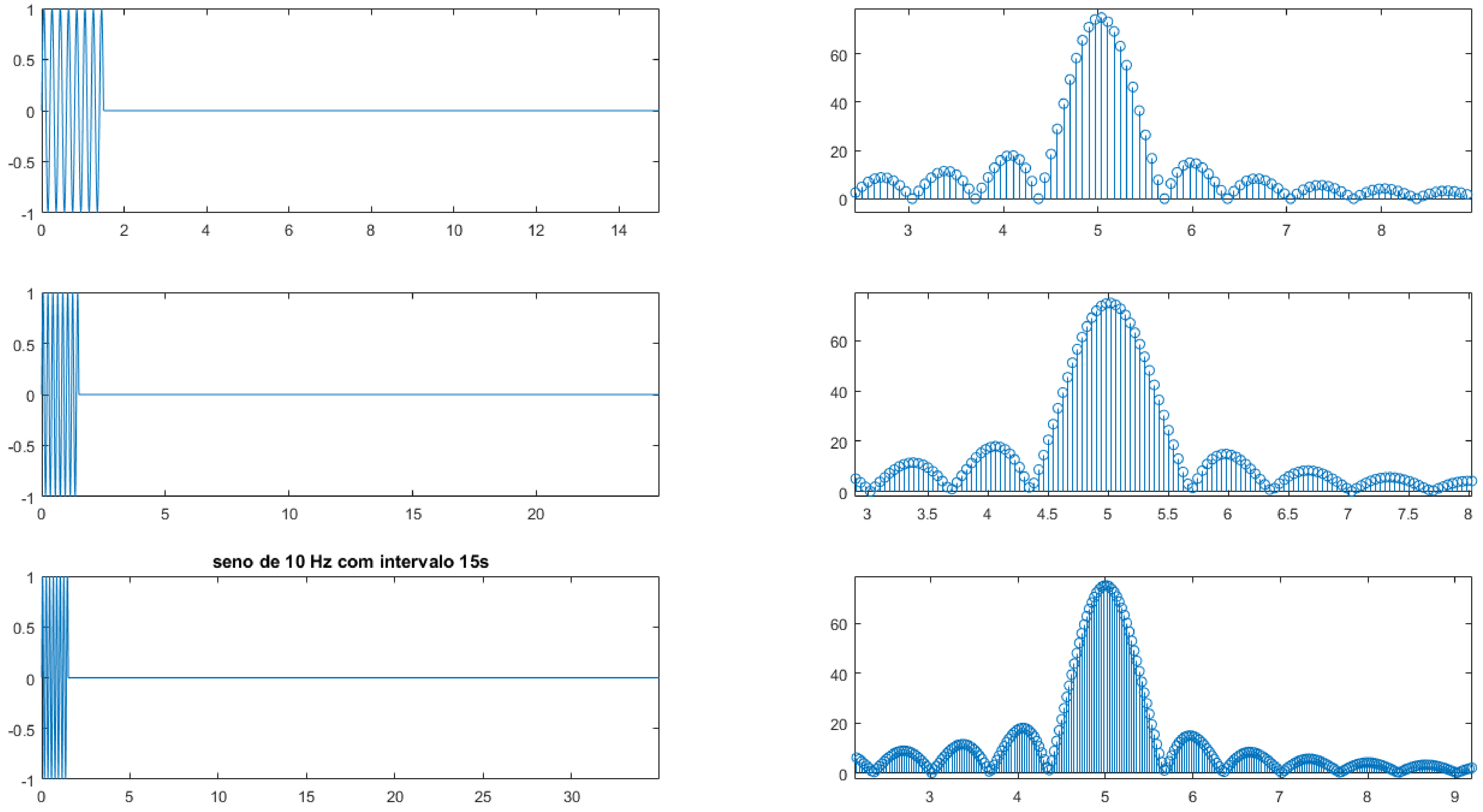


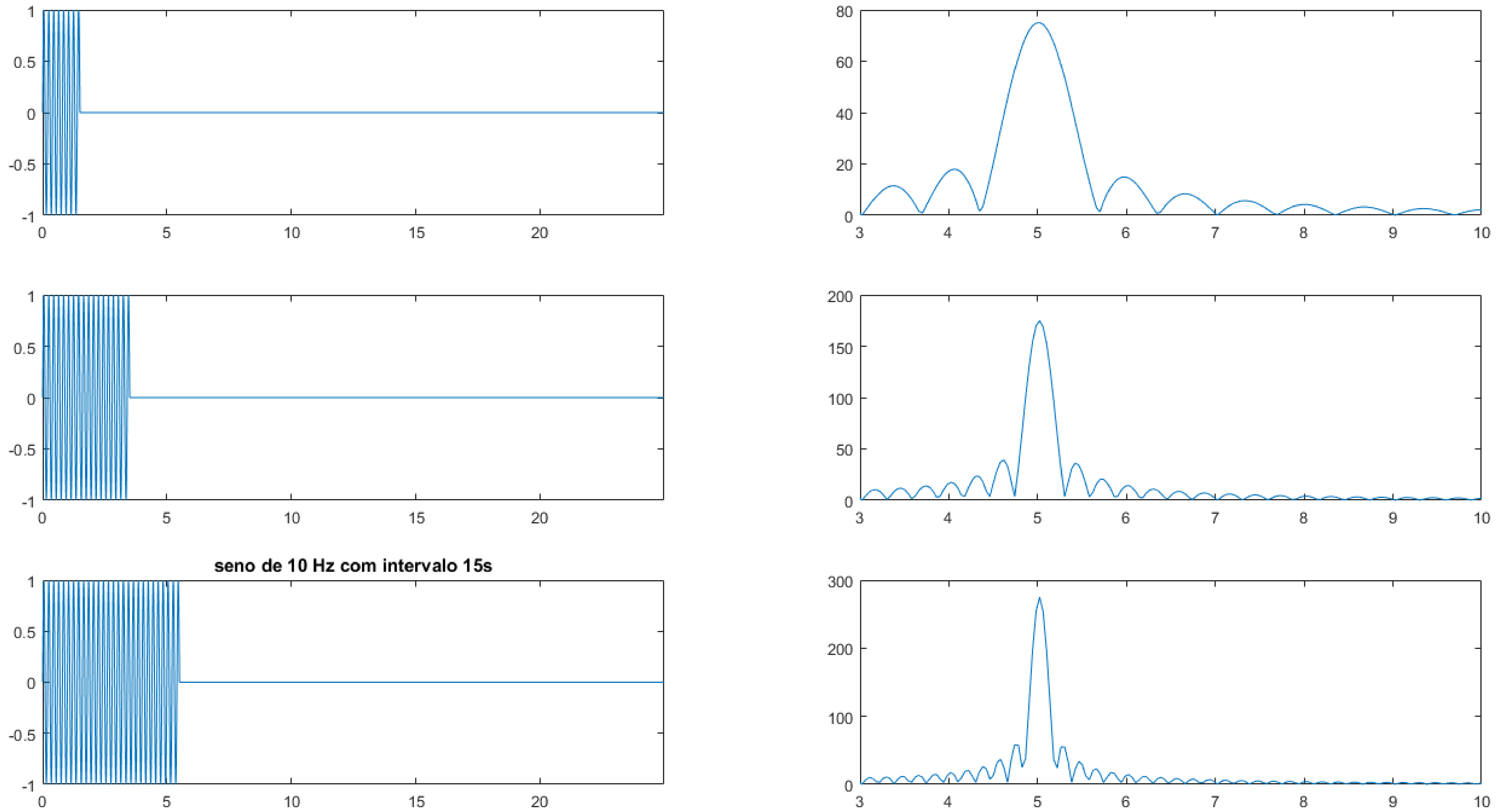

seno de 10 Hz com intervalo 1s
1
0.5
0
-0.5
-1
0
0.2
0.4
0.6
0.8
1
60
40
20
0
0
5
10
15
20
25
30
35
40
45
50
seno de 10 Hz com intervalo 5
1
0.5
0
-0.5
-1
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
250
200
150
100
50
0
0
5
10
15
20
25
30
35
40
45
50
seno de 10 Hz com intervalo 15s
1
0.5
0
-0.5
-1
0
5
10
15
800
600
400
200
0
0
5
10
15
20
25
30
35
40
45
50

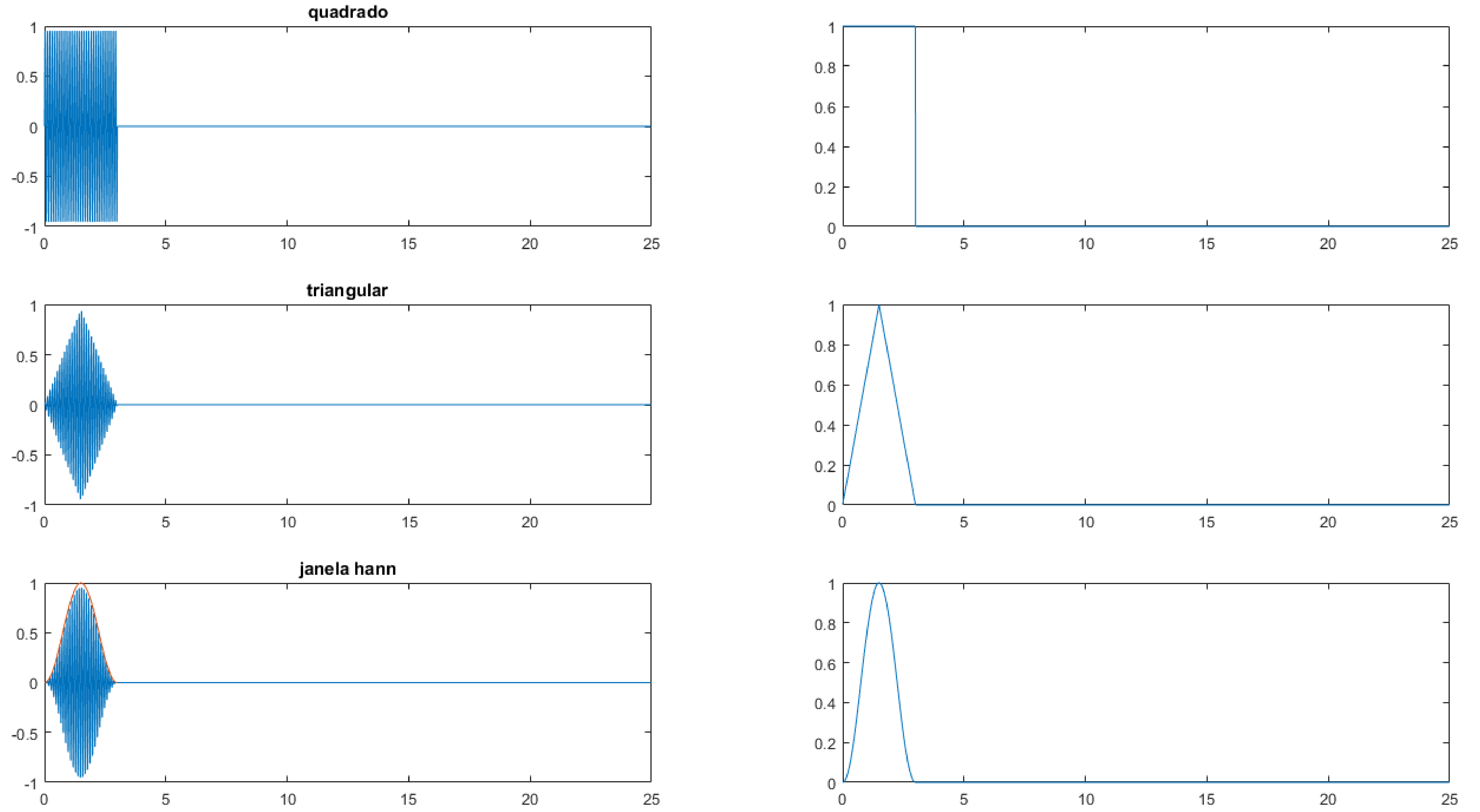

seno de 10 Hz com intervalo 1s
1
0.5
0
-0.5
-1
0 0.2 0.4 0.6 0.8 1
60
40
20
0
0 2 4 6 8 10 12 14 16 18 20
seno de 10 Hz com intervalo 5
1
0.5
0
-0.5
-1
0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5
300
200
100
0
0 2 4 6 8 10 12 14 16 18 20
seno de 10 Hz com intervalo 15
1
0.5
0
-0.5
-1
0 5 10 15
800
600
400
200
0
0 2 4 6 8 10 12 14 16 18 20

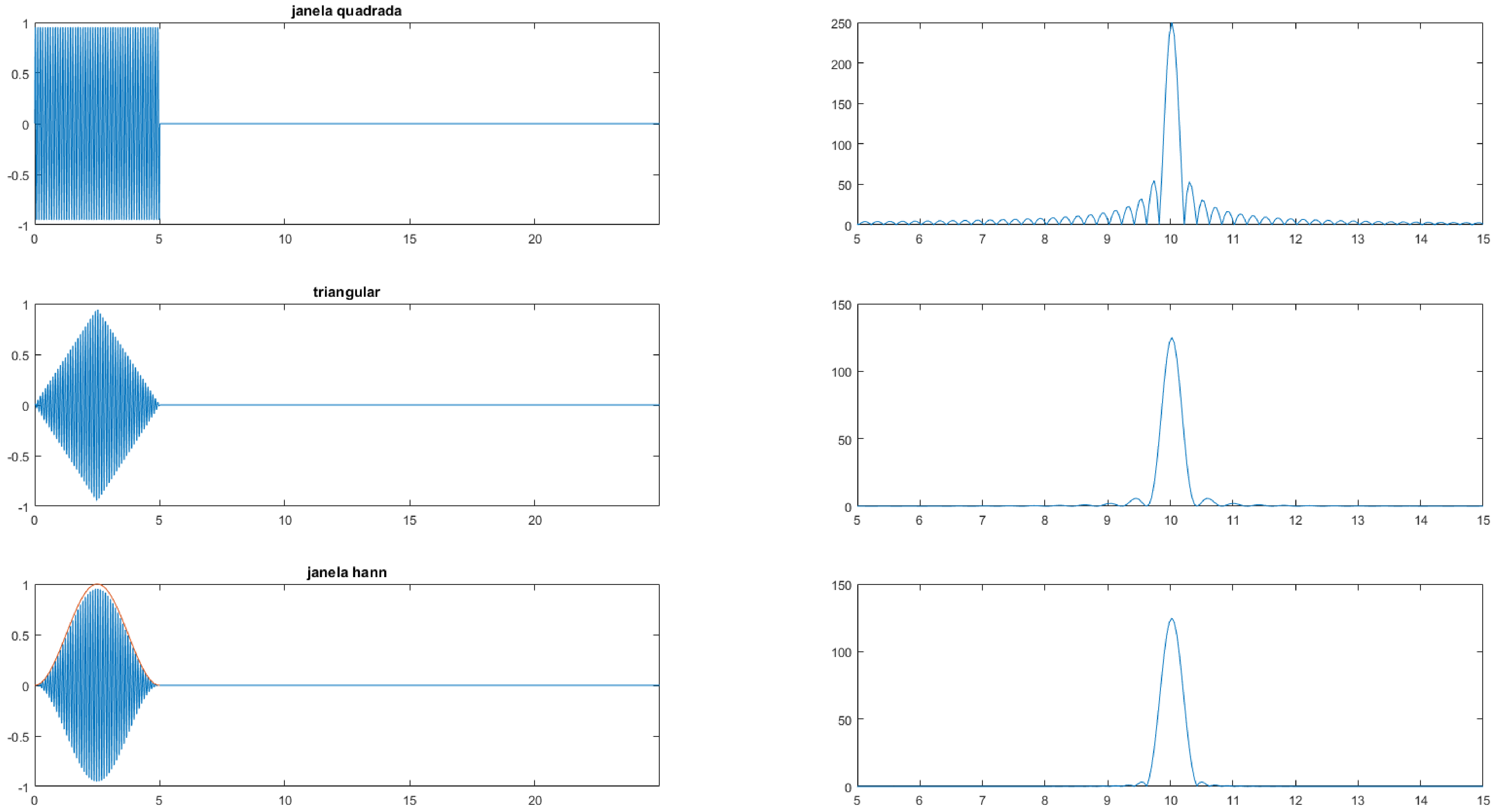

seno de 7.5 Hz com intervalo 1s
seno de 7.5 Hz com intervalo 5
seno de 7.5 Hz com intervalo 15


seno de 10 Hz com intervalo 15s
1
0.5
0
-0.5
-1
0
5
10
15
800
600
400
200
0
0 5 10 15 20 25 30 35 40 45 50
funçao caixa
1
0.8
0.6
0.4
0.2
0
0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5
100
80
60
40
20
0
-4 -3 -2 -1 0 1 2 3 4
seno de 10 Hz com intervalo 15s
1
0.5
0
-0.5
-1
0 5 10 15
150
100
50
0
-15 -10 -5 0 5 10 15


seno de 10 Hz com intervalo 15s


seno de 10 Hz com intervalo 15s
1
0.5
0
-0.5
-1
0
5
10
15
20
80
60
40
20
200
150
100
50
300
3
4
6
7
8
9
10


quadrado
triangular
janela hann
1
0.5
0
-0.5
-1
0.8
0.6
0.4
0.2
0
5
10
15
20
25

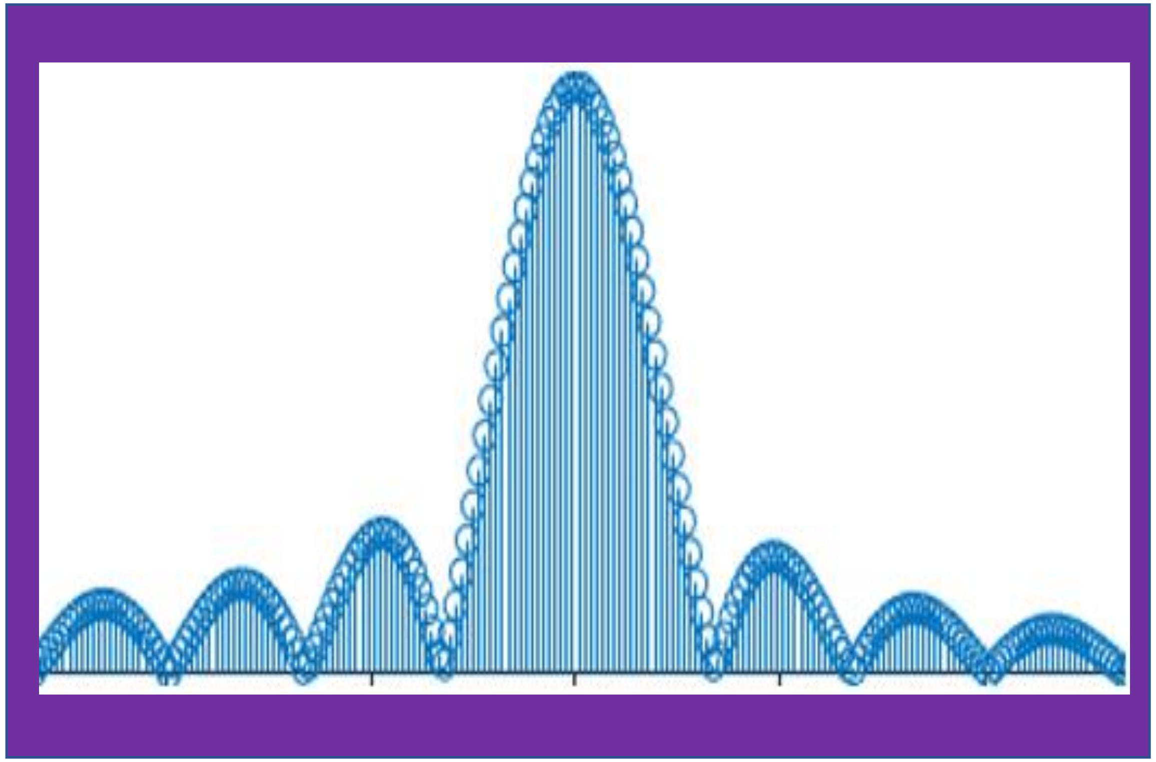

janela quadrada
triangular
janela hann
1
0.5
0
-0.5
-1
0
5
10
15
20
250
200
150
100
50
6
7
8
9
11
12
13
14

Caracteristicas das janelas

- Retangular;
- Triangular;
- Hanning;
- Hamming;
- Kaiser-Bessel;
- Flattop;
- Blackman.

Principais tipos de janelas

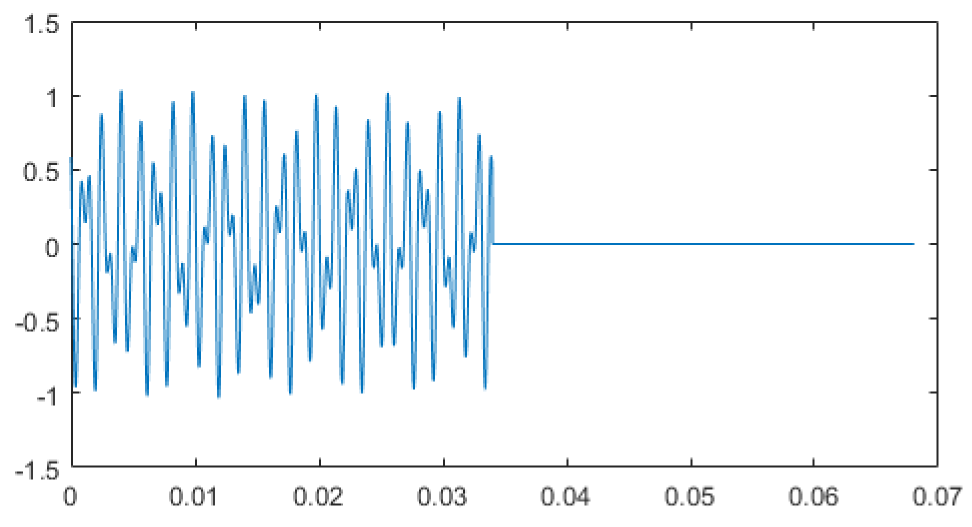
- ***Resolução:*** capacidade de distinção das diferentes frequências – inversamente proporcional á largura do lóbulo principal;
- ***Pico – nível de lóbulo lateral:*** resposta máxima fora do lóbulo principal determina se os sinais pequenos são escondidos, pelos vizinhos mais fortes
- ***Decaimento dos lóbulos laterais:*** decaimento dos lóbulos laterais por década

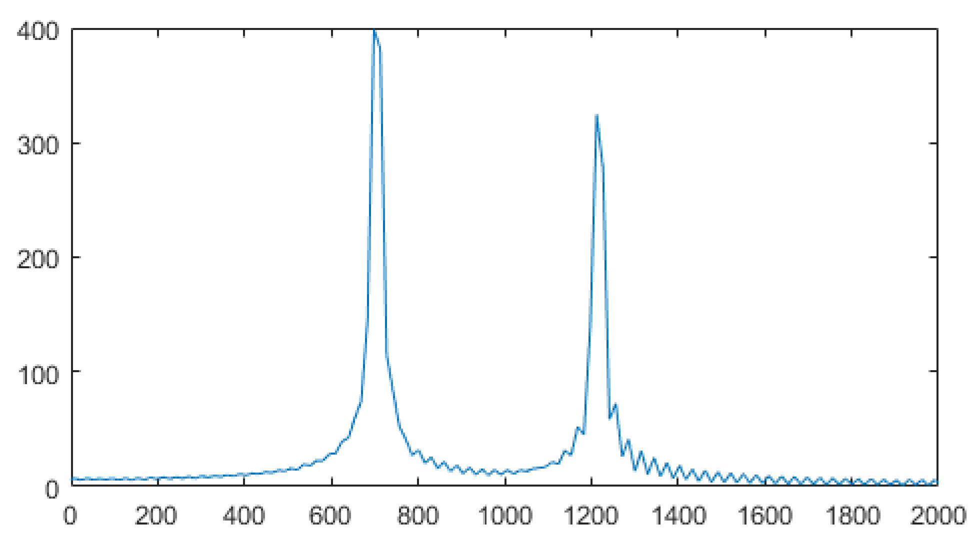


Dados reais

Dados reais

```
ysel = y(2.83e5:2.845e5);
ysel = [ysel' zeros(1,numel(ysel))]
t = (0:numel(ysel)-1).*1/Fs;
%subplot(3,2,3);
figure;
plot(t,ysel)
yy = fft(ysel);
n = numel(yy);
freq = linspace(-n/2,n/2,n).*Fs/n;
yy = fftshift(yy);
%subplot(3,2,4);
figure;
plot(freq,abs(yy));xlim([0 2000])
```





Dados reais

```
clear ysel;
ysel = y(2.83e5:2.845e5);
ysel = ysel.*hann(numel(ysel));
ysel = [ysel' zeros(1,numel(ysel))]
t = (0:numel(ysel)-1).*1/Fs;
figure;
plot(t,ysel)
yy = fft(ysel);
n = numel(yy);
freq = linspace(-n/2,n/2,n).*Fs/n;
yy = fftshift(yy);
%subplot(3,2,4);
figure;
plot(freq,abs(yy));xlim([0 2000])
```