Diskretne Fourierova transformacija (DFT)

Projektna naloga

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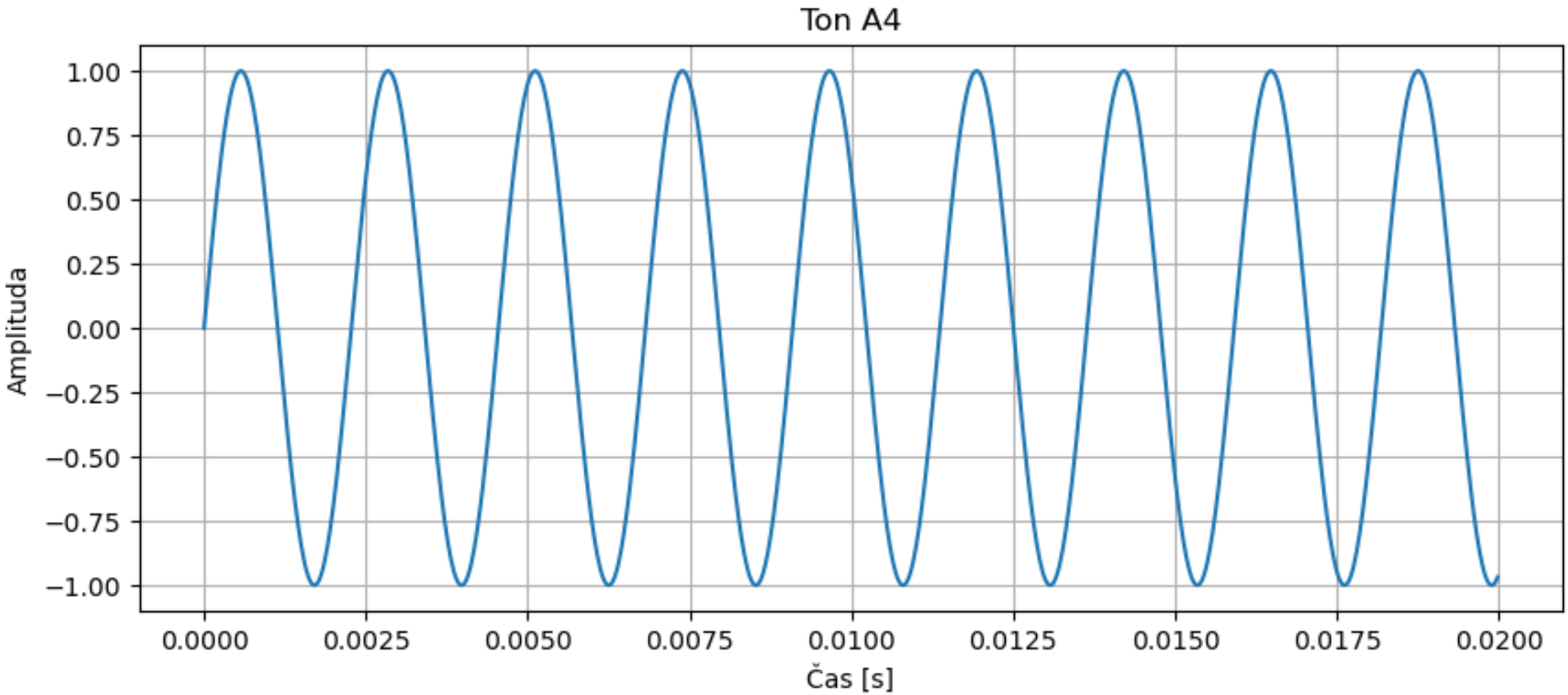
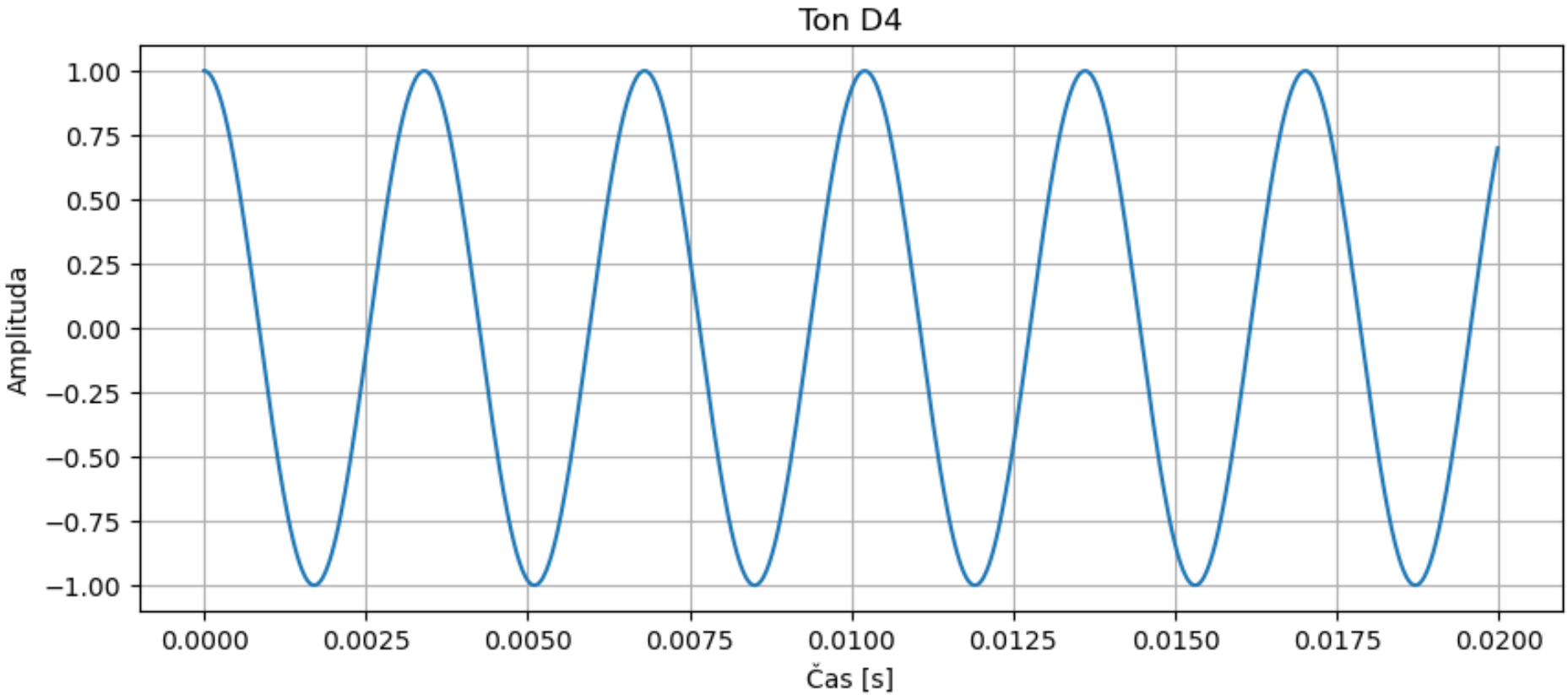
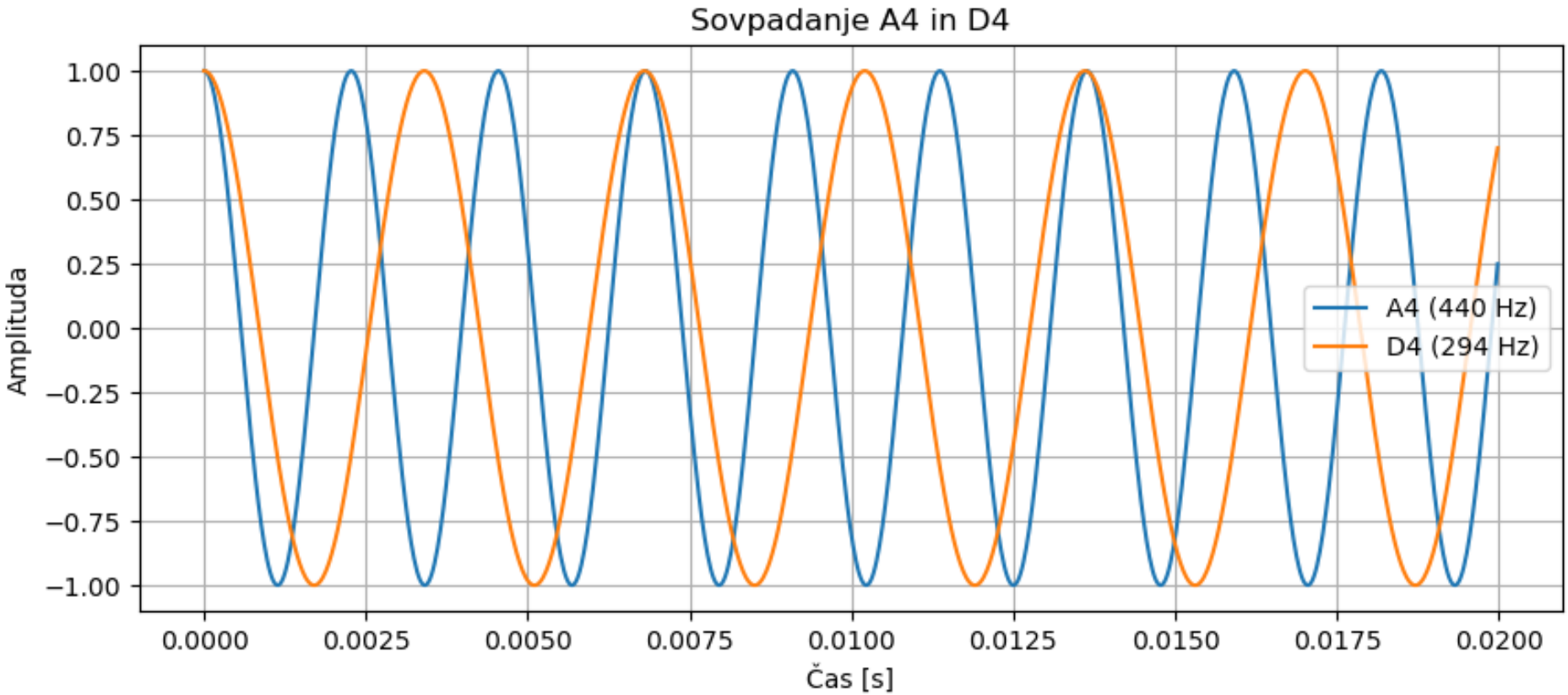
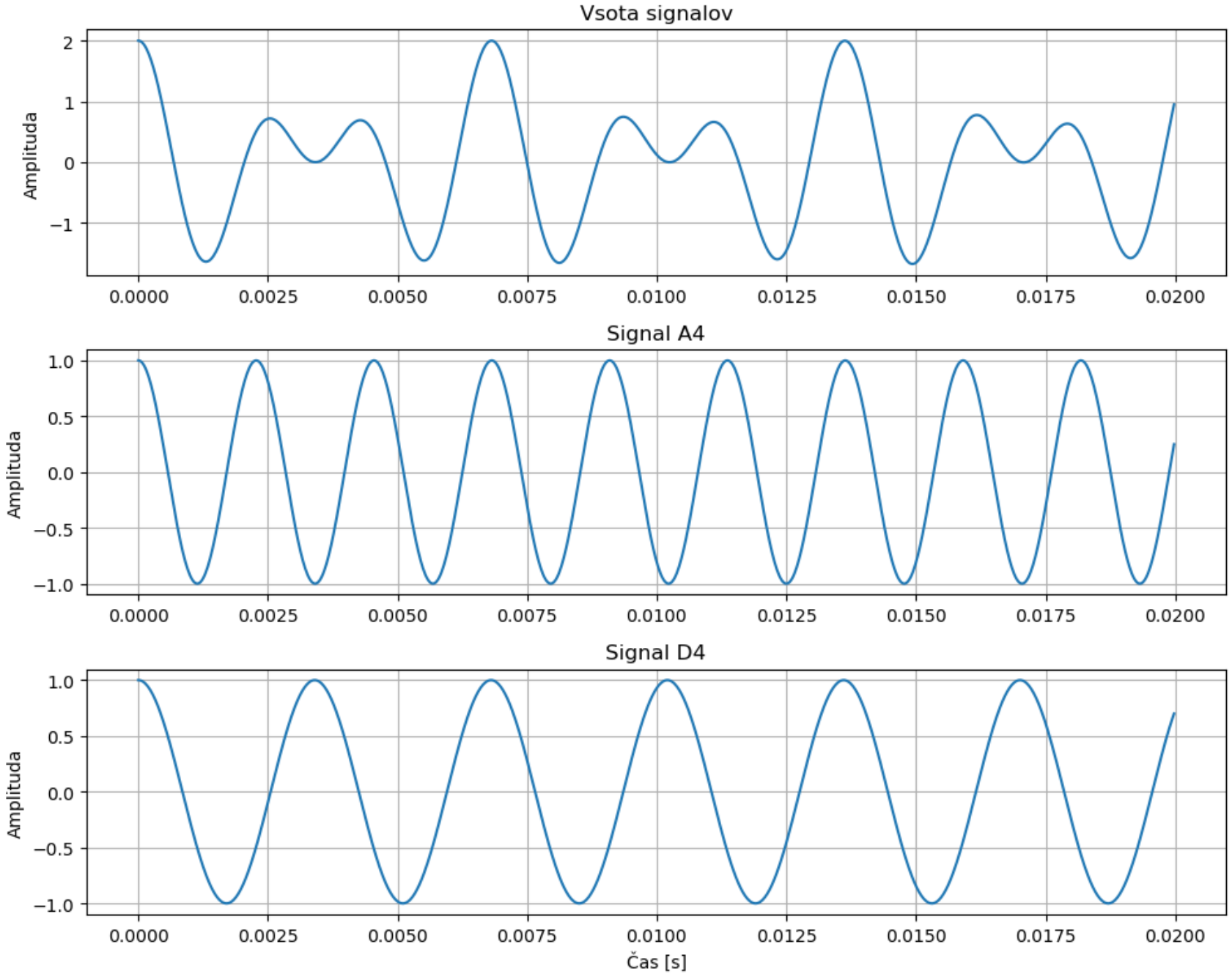
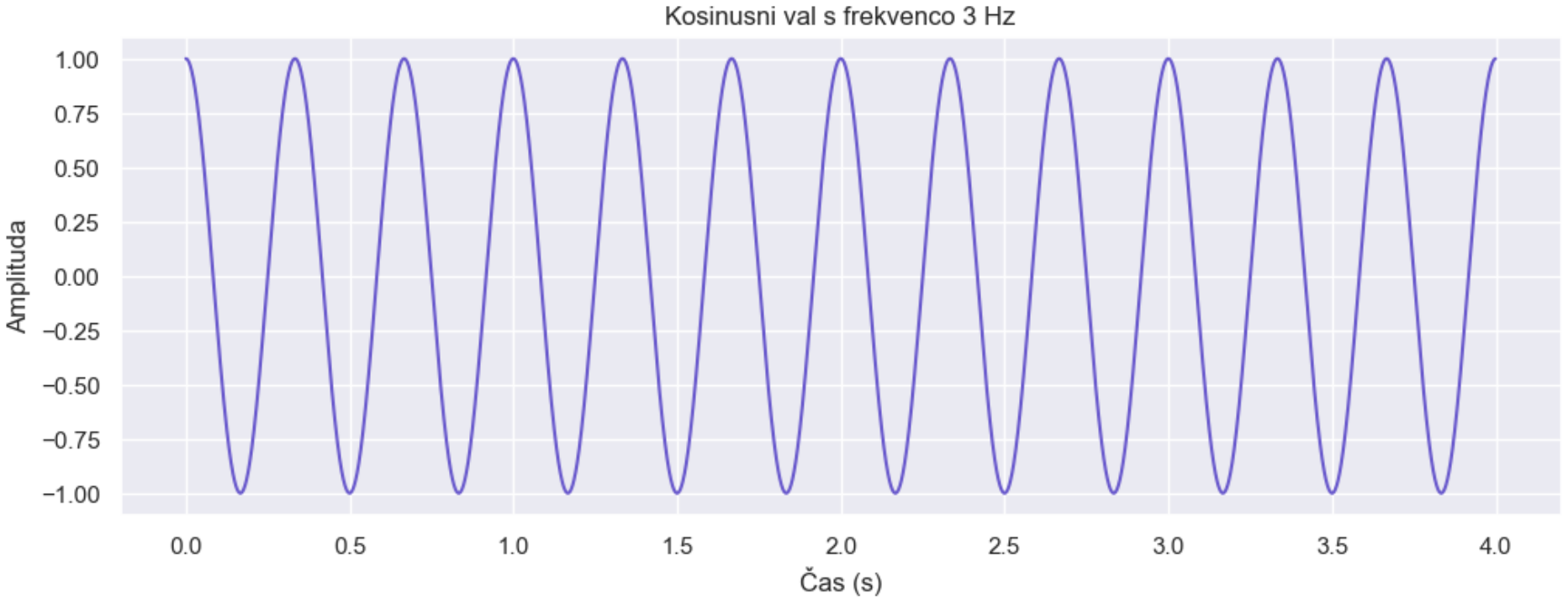
20. januar 2026

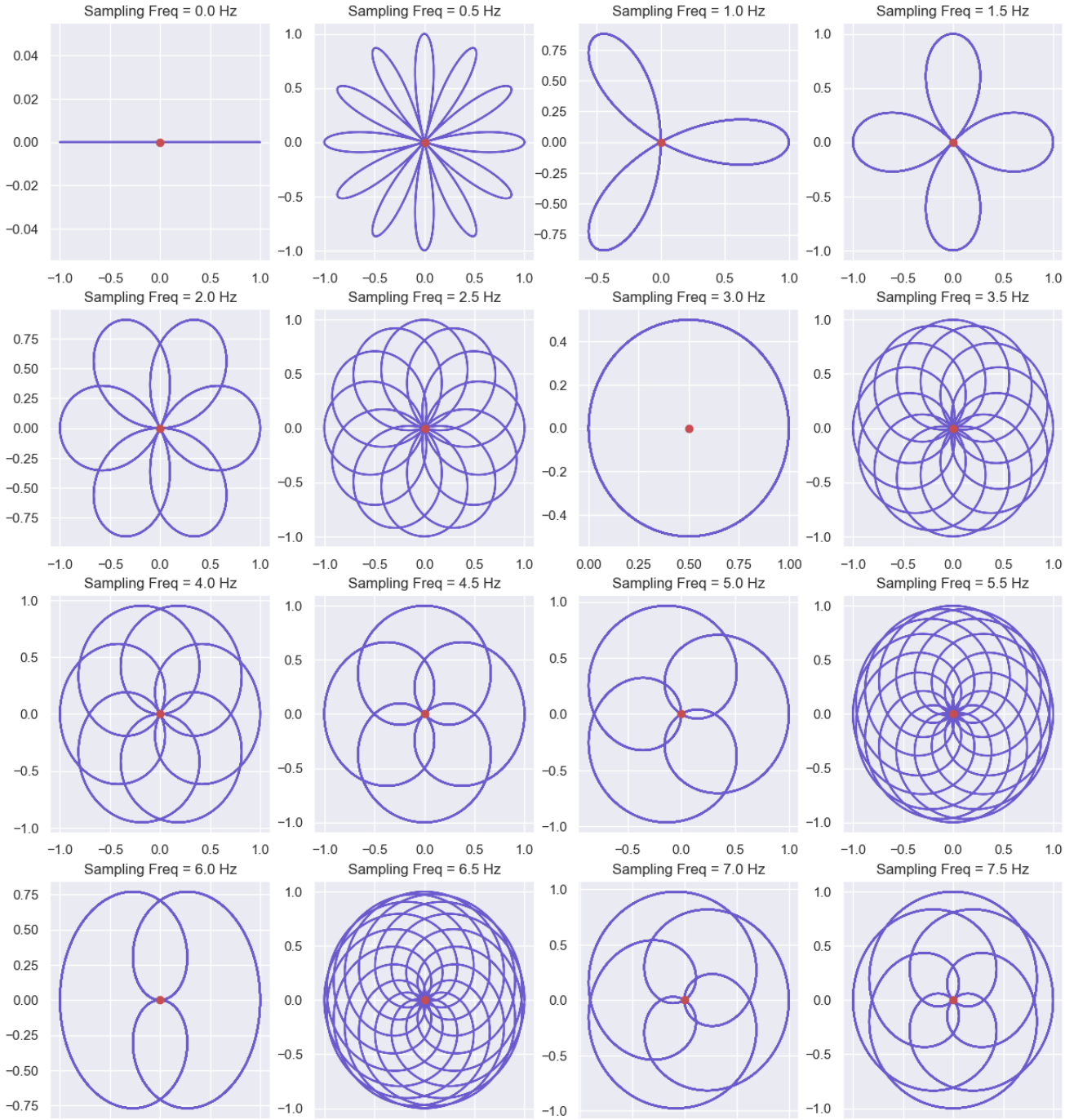

Ton A4
Amplituda
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
0.0000
0.0025
0.0050
0.0075
0.0100
0.0125
0.0150
0.0175
0.0200
Čas [s]

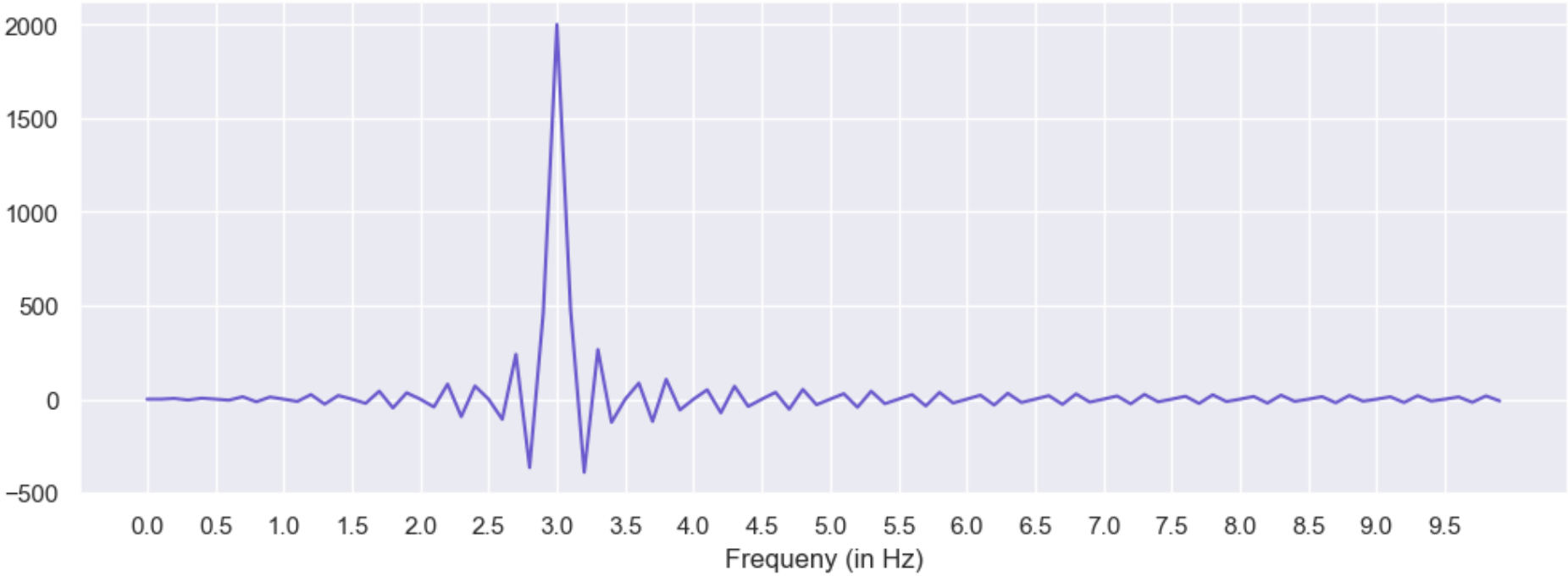

Ton D4
Amplituda
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
0.0000
0.0025
0.0050
0.0075
0.0100
0.0125
0.0150
0.0175
0.0200
Čas [s]

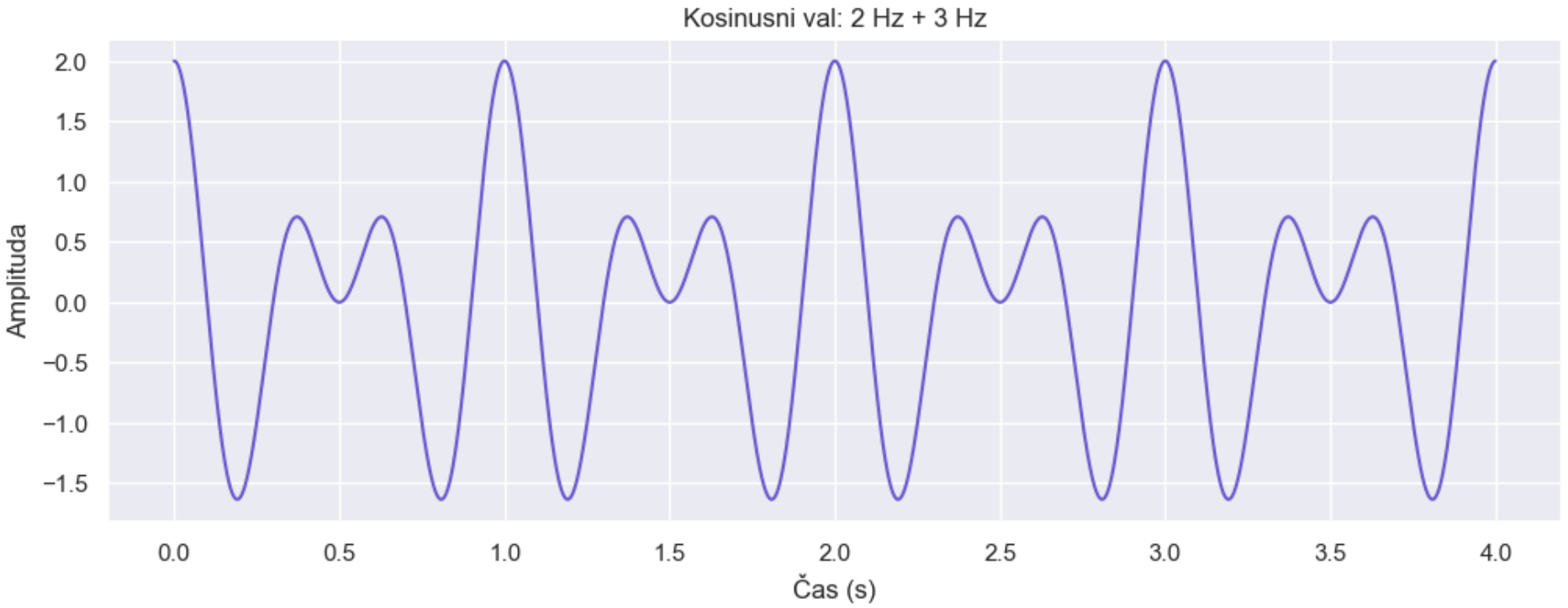

Sovpadanje A4 in D4
Amplituda
Čas [s]
A4 (440 Hz)
D4 (294 Hz)
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
0.0000
0.0025
0.0050
0.0075
0.0100
0.0125
0.0150
0.0175
0.0200

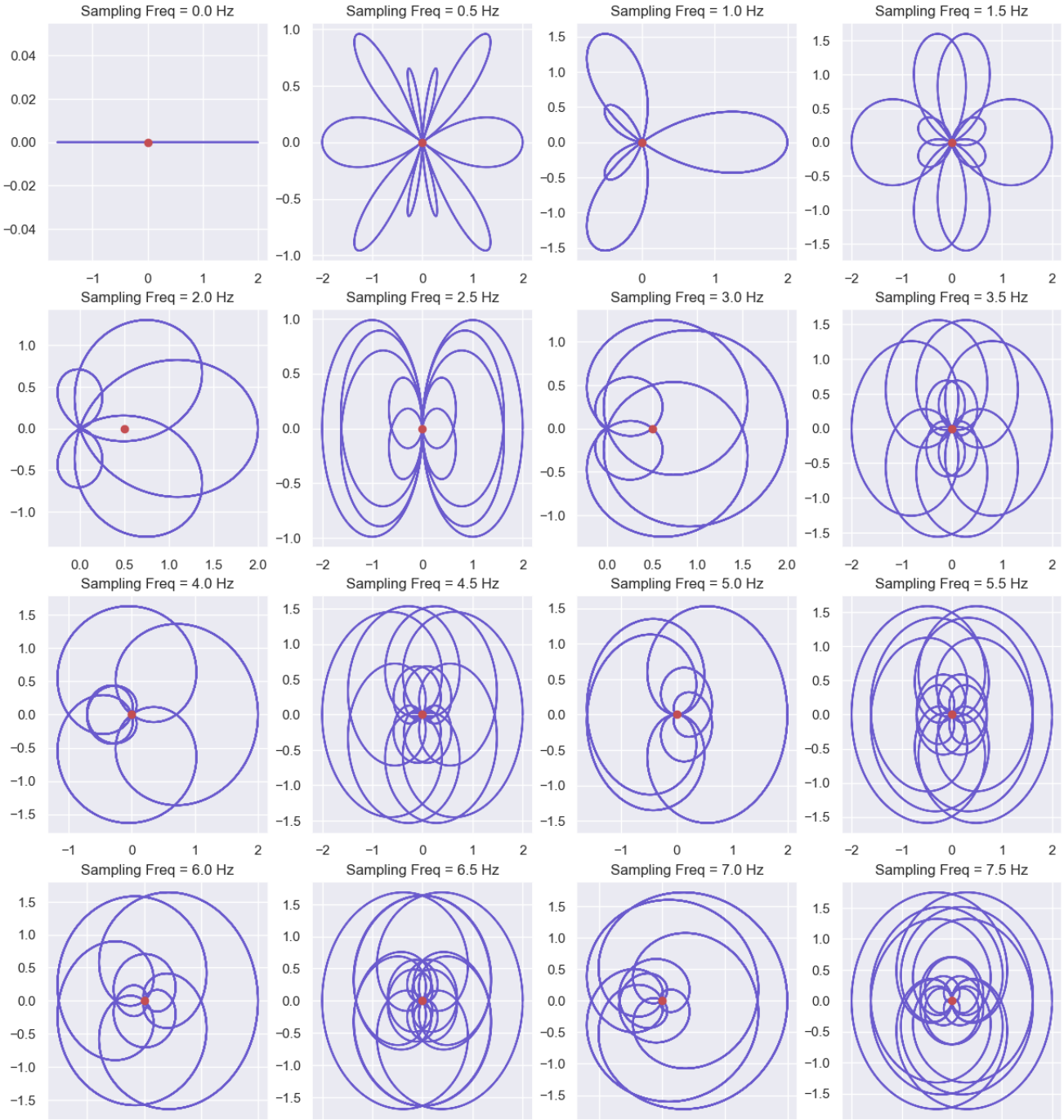

Vsota signalov
Amplituda
2
1
0
−1
0.0000
0.0025
0.0050
0.0075
0.0100
0.0125
0.0150
0.0175
0.0200
Signal A4
Amplituda
1.0
0.5
0.0
−0.5
−1.0
0.0000
0.0025
0.0050
0.0075
0.0100
0.0125
0.0150
0.0175
0.0200
Signal D4
Amplituda
1.0
0.5
0.0
−0.5
−1.0
0.0000
0.0025
0.0050
0.0075
0.0100
0.0125
0.0150
0.0175
0.0200
Čas [s]

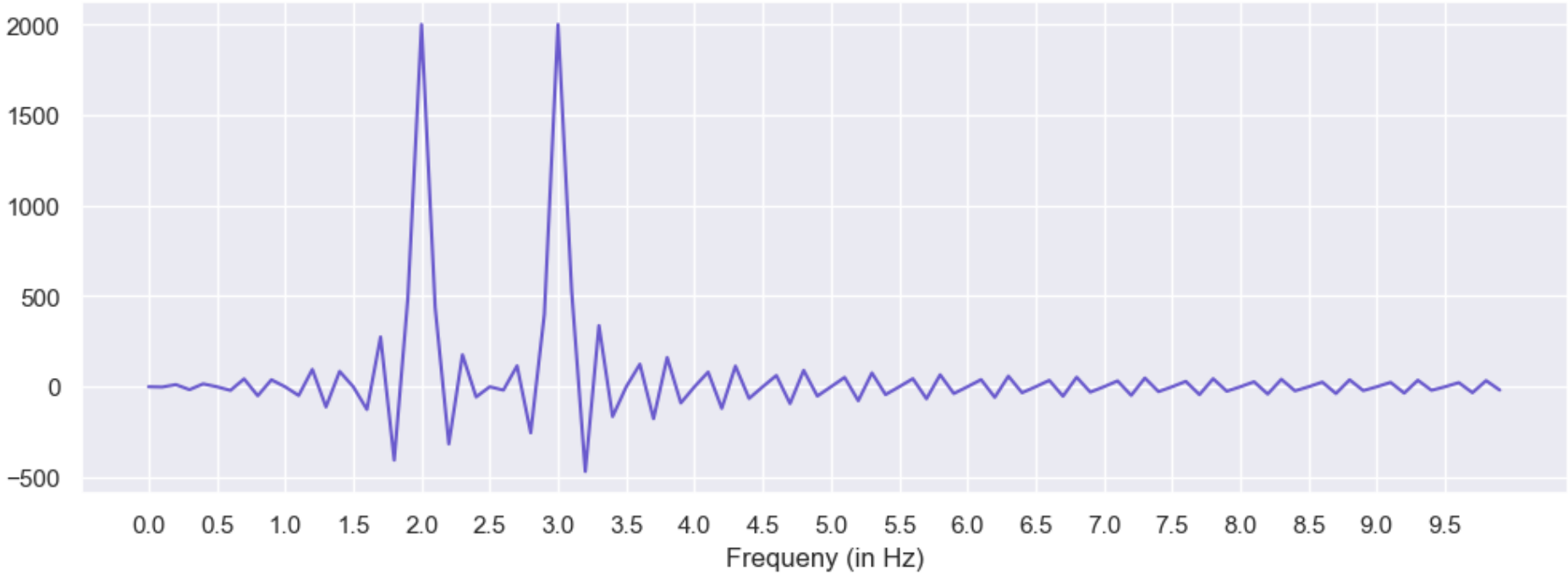

Kosinusni val s frekvenco 3 Hz
Amplituda
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
Čas (s)

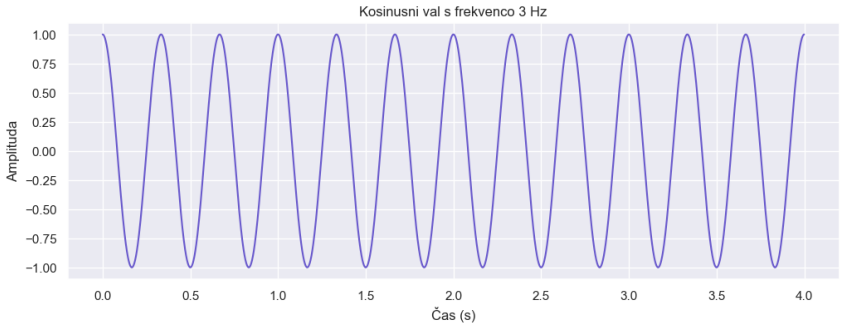

Sampling Freq = 0.0 Hz
Sampling Freq = 0.5 Hz
Sampling Freq = 1.0 Hz
Sampling Freq = 1.5 Hz
Sampling Freq = 2.0 Hz
Sampling Freq = 2.5 Hz
Sampling Freq = 3.0 Hz
Sampling Freq = 3.5 Hz
Sampling Freq = 4.0 Hz
Sampling Freq = 4.5 Hz
Sampling Freq = 5.0 Hz
Sampling Freq = 5.5 Hz
Sampling Freq = 6.0 Hz
Sampling Freq = 6.5 Hz
Sampling Freq = 7.0 Hz
Sampling Freq = 7.5 Hz


2000
1500
1000
500
0
−500
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
6.5
7.0
7.5
8.0
8.5
9.0
9.5
Frequeny (in Hz)

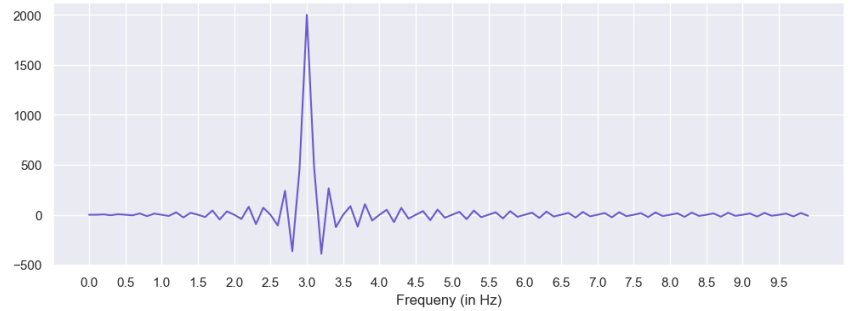

Kosinusni val: 2 Hz + 3 Hz
Amplituda
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
Čas (s)

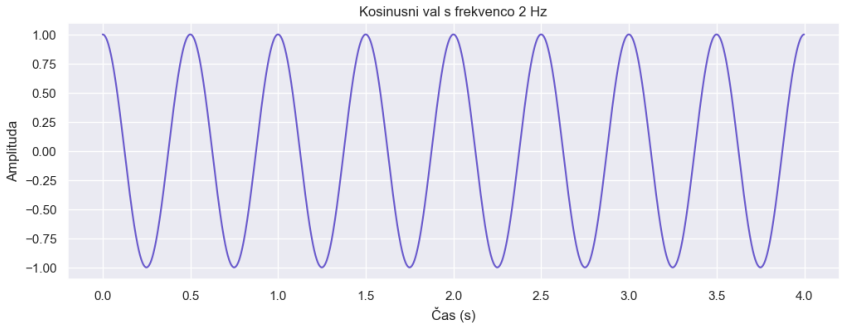

Sampling Freq = 0.0 Hz
Sampling Freq = 0.5 Hz
Sampling Freq = 1.0 Hz
Sampling Freq = 1.5 Hz
Sampling Freq = 2.0 Hz
Sampling Freq = 2.5 Hz
Sampling Freq = 3.0 Hz
Sampling Freq = 3.5 Hz
Sampling Freq = 4.0 Hz
Sampling Freq = 4.5 Hz
Sampling Freq = 5.0 Hz
Sampling Freq = 5.5 Hz
Sampling Freq = 6.0 Hz
Sampling Freq = 6.5 Hz
Sampling Freq = 7.0 Hz
Sampling Freq = 7.5 Hz


2000
1500
1000
500
0
−500
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
6.5
7.0
7.5
8.0
8.5
9.0
9.5
Frequeny (in Hz)

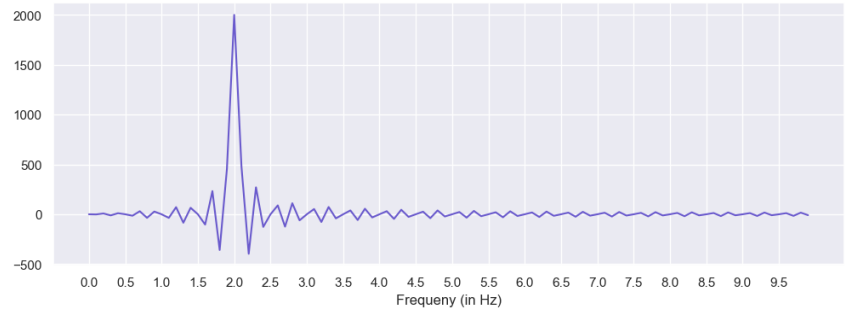


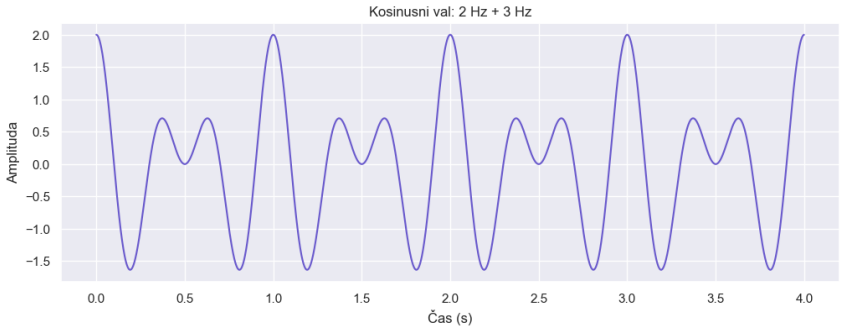
$\longrightarrow$ **DFT**



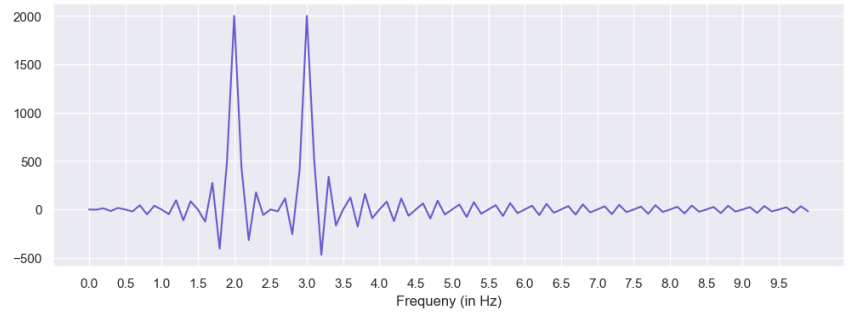


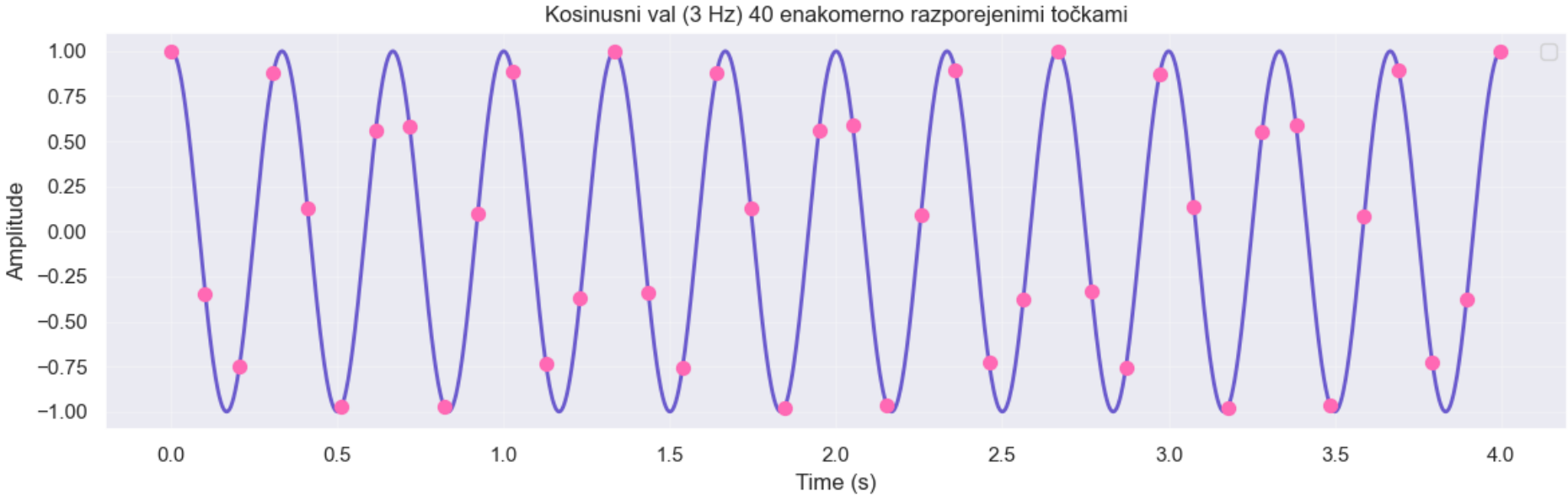
$\longrightarrow$ **DFT**

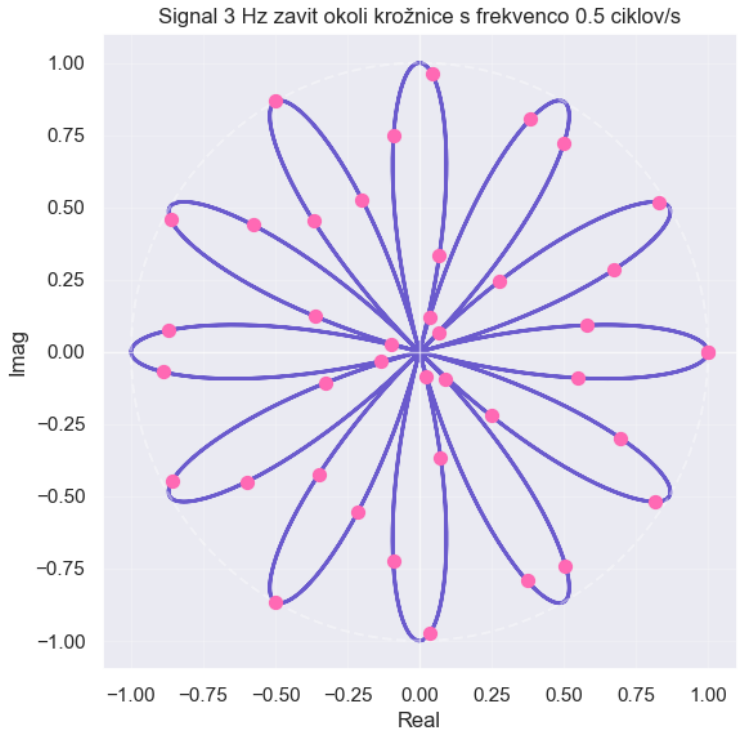


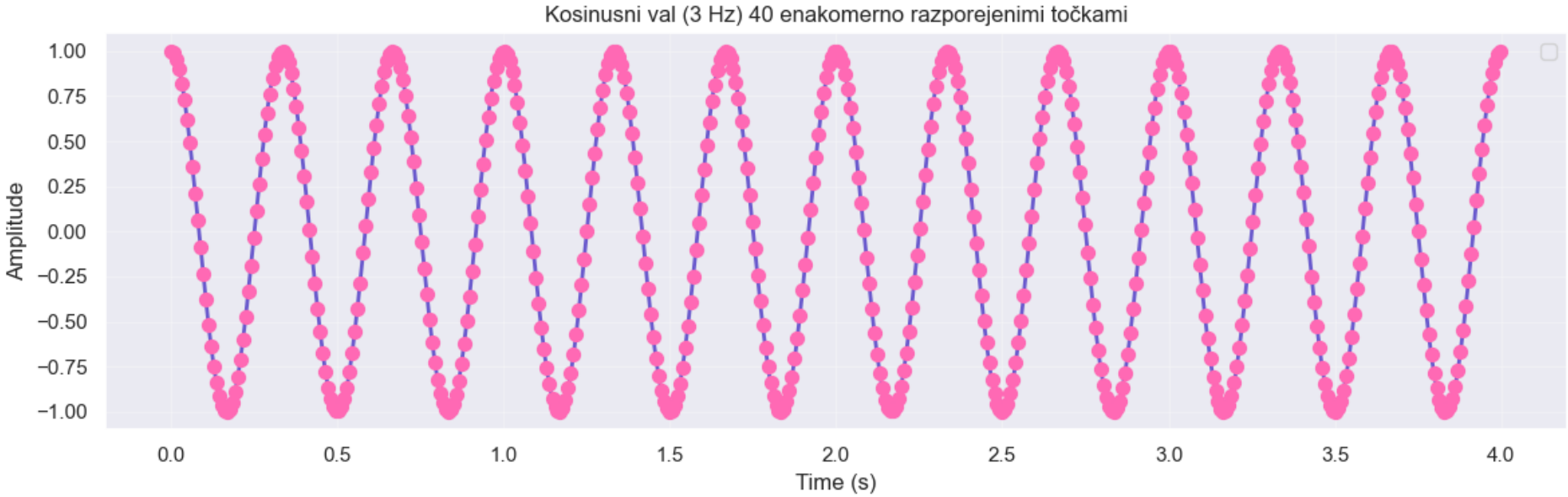


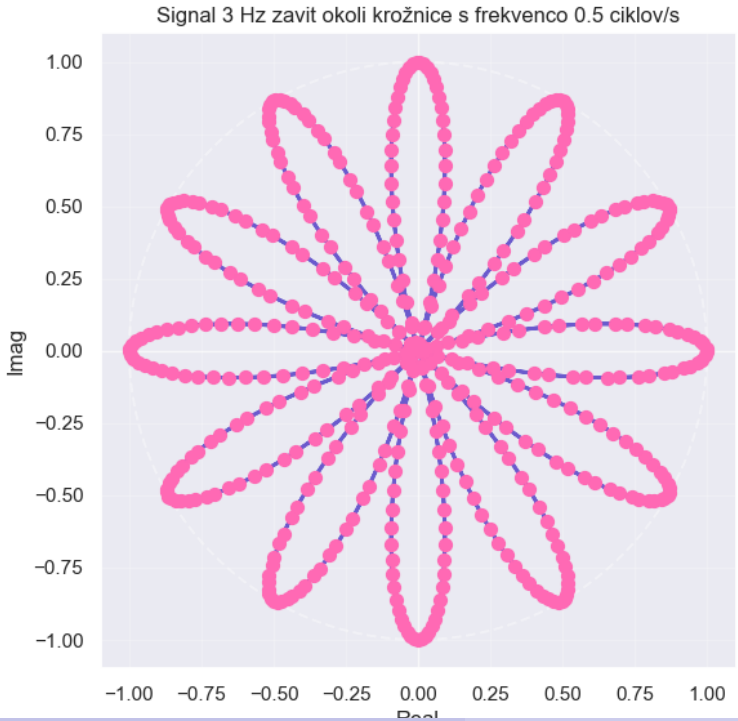
$\longrightarrow$ **DFT**




Kosinusni val (3 Hz) 40 enakomerno razporejenimi točkami
Amplitude
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
Time (s)


Signal 3 Hz zavit okoli krožnice s frekvenco 0.5 ciklov/s
Imag
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
−1.00
−0.75
−0.50
−0.25
0.00
0.25
0.50
0.75
1.00
Real





DFT:

$$X_k = \sum_{n=0}^{N-1} x_n \cdot e^{-2\pi i \frac{k}{N} n}$$

IDFT:

$$x_n = \frac{1}{N} \sum_{k=0}^{N-1} X_k \cdot e^{2\pi i \frac{k}{N} n}$$

$$k, n = 0, 1, \ldots, N-1$$