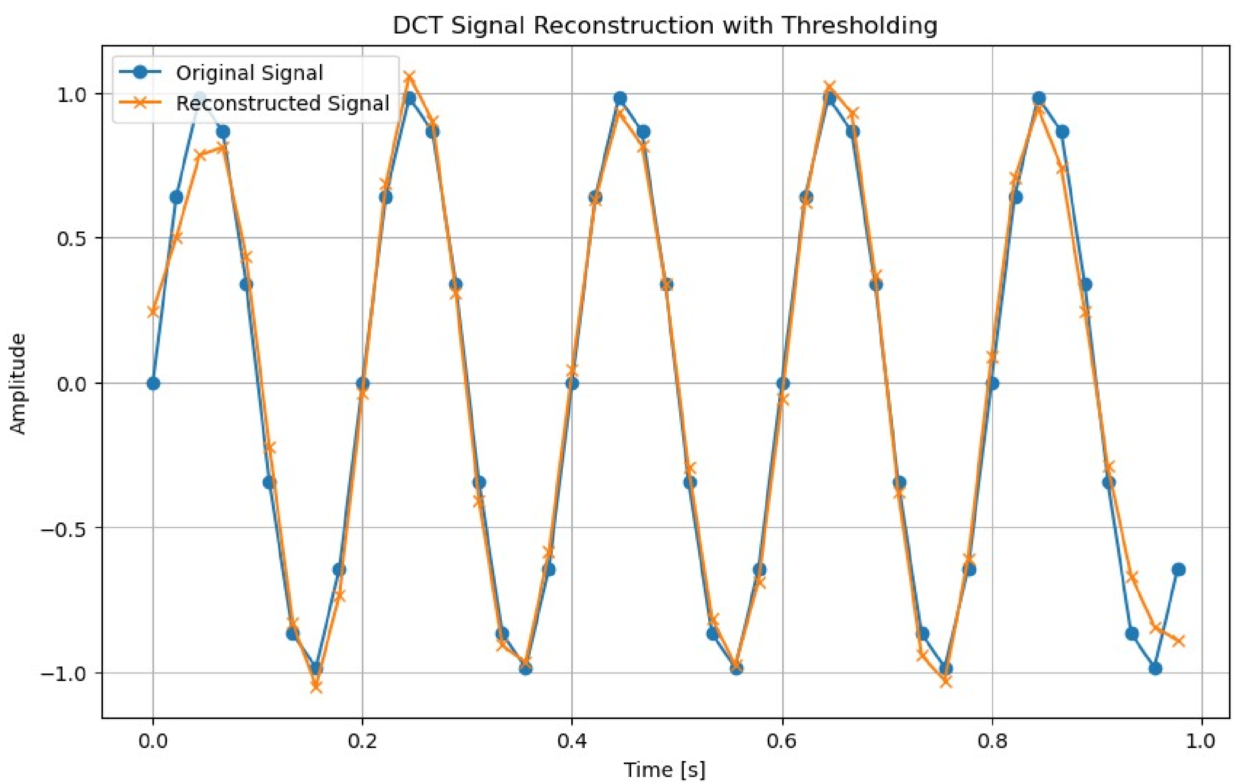
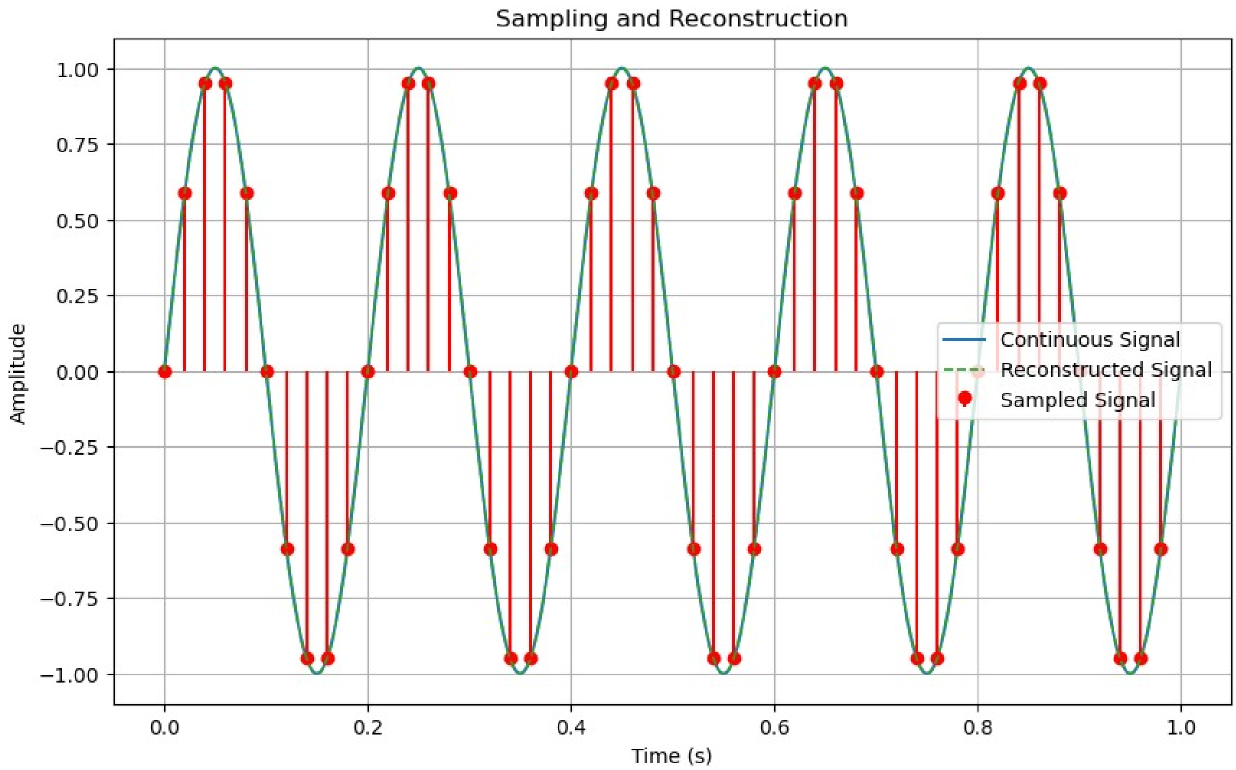
```python
import numpy as np
from scipy.fftpack import dct, idct
import matplotlib.pyplot as plt


f = 50  # częstotliwość sygnału w Hz
fs = 45  # częstotliwość próbkowania w Hz
t = np.arange(0, 1, 1/fs)  # czas próbkowania
signal = np.sin(2 * np.pi * f * t)  # generowanie sygnału o
częstotliwości f = 50 Hz

# Zastosowanie DCT
dct_coeffs = dct(signal, norm='ortho')
print("DCT Coefficients:", dct_coeffs)

# Thresholding
threshold = 0.5
dct_coeffs_thresholded = np.where(np.abs(dct_coeffs) < threshold, 0,
dct_coeffs)
print("Thresholded DCT Coefficients:", dct_coeffs_thresholded)

# Rekonstrukcja sygnału za pomocą IDCT
reconstructed_signal = idct(dct_coeffs_thresholded, norm='ortho')
print("Reconstructed Signal:", reconstructed_signal)

# Wykres oryginalnego i zrekonstruowanego sygnału
plt.figure(figsize=(10, 6))
plt.plot(t, signal, label='Original Signal', marker='o')
plt.plot(t, reconstructed_signal, label='Reconstructed Signal',
marker='x')
plt.title('DCT Signal Reconstruction with Thresholding')
plt.xlabel('Time [s]')
plt.ylabel('Amplitude')
plt.legend()
plt.grid(True)
plt.show()
```

```
DCT Coefficients: [ 3.70725100e-15  5.84956835e-01  1.52686024e-14
6.35394502e-01
  5.53203316e-15  7.68524057e-01  5.48693035e-15  1.12474519e+00
 -6.59888810e-15  2.99910330e+00 -1.62234399e+00 -2.69018436e+00
  1.29757316e-15 -8.09911887e-01 -2.26554886e-15 -4.41115864e-01
 -6.28316843e-15 -2.87003792e-01  3.16413562e-15 -2.03739642e-01
  5.22498711e-15 -1.52233193e-01  4.28129754e-15 -1.17529095e-01
  7.68829445e-15 -9.26953435e-02  1.06858966e-14 -7.40903487e-02
 -3.80251386e-15 -5.96224169e-02  1.45439216e-14 -4.80055956e-02
  3.16413562e-15 -3.84047252e-02  1.24344979e-14 -3.02512943e-02
 -1.06581410e-14 -2.31412004e-02 -6.99440506e-15 -1.67745892e-02
 -5.32907052e-15 -1.09184811e-02 -6.43929354e-15 -5.38218921e-03
  4.99600361e-16]
```

```
Thresholded DCT Coefficients: [ 0.          0.58495683  0.
0.6353945   0.          0.76852406
  0.          1.12474519  0.          2.9991033  -1.62234399 -
2.69018436
  0.         -0.80991189  0.          0.          0.          0.
  0.          0.          0.          0.          0.          0.
  0.          0.          0.          0.          0.          0.
  0.          0.          0.          0.          0.          0.
  0.          0.          0.          0.          0.          0.
  0.          0.          0.        ]
Reconstructed Signal: [ 0.24671473  0.50101617  0.78581265  0.81236526
0.43708849 -0.21983528
 -0.82930948 -1.04890137 -0.73463835 -0.03540677  0.68707576
1.06051539
  0.90349185  0.31195303 -0.40754324 -0.90657527 -0.96601788 -
0.58448144
  0.04411611  0.63372929  0.93207904  0.81790615  0.34202014 -
0.29390089
 -0.81329669 -0.97574944 -0.68690372 -0.05830617  0.62399773
1.02535762
  0.9315485   0.37208725 -0.37948659 -0.94173304 -1.0290959  -
0.60738084
  0.09185074  0.70688122  0.94809182  0.74384054  0.24695179 -0.28836
 -0.6670303  -0.84303632 -0.88950234]
```



```
import numpy as np
import matplotlib.pyplot as plt
from scipy.signal import resample

# Oryginalny sygnał ciągły
fs_continuous = 1000  # Częstotliwość próbkowania dla wizualizacji
t_continuous = np.linspace(0, 1, fs_continuous, endpoint=False)
signal_continuous = np.sin(2 * np.pi * 5 * t_continuous)  # Sygnał o
częstotliwości 5 Hz

# Próbkowanie
fs_sampled = 50  # Próbkowanie przy 50 Hz
t_sampled = np.linspace(0, 1, fs_sampled, endpoint=False)
signal_sampled = np.sin(2 * np.pi * 5 * t_sampled)  # Próbkowanie
sygnału o 5 Hz

# Rekonstrukcja
fs_reconstructed = 1000  # Rekonstrukcja do 1000 Hz
t_reconstructed = np.linspace(0, 1, fs_reconstructed, endpoint=False)
signal_reconstructed = resample(signal_sampled, len(t_reconstructed))

# Wykres
plt.figure(figsize=(10, 6))
plt.plot(t_continuous, signal_continuous, label="Continuous Signal",
lw=1.5)
plt.stem(t_sampled, signal_sampled, linefmt='r-', markerfmt='ro',
basefmt=" ", label="Sampled Signal")
plt.plot(t_reconstructed, signal_reconstructed, label="Reconstructed
Signal", lw=1.2, linestyle='--')
plt.legend()
plt.xlabel("Time (s)")
plt.ylabel("Amplitude")
plt.title("Sampling and Reconstruction")
plt.grid(True)
plt.show()
```


Sampling and Reconstruction
Amplitude
Time (s)
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
0.0
0.2
0.4
0.6
0.8
1.0
Continuous Signal
Reconstructed Signal
Sampled Signal