1. Task 1
   a) Explain why DCT transform is used in Image Compression instead of FFT? Explain the differences between two transforms theoretically.
   b) Consider the series $x = [8, 16, 24, 32, 40, 48, 56, 64]$. Perform FFT and DCT in order to see the differences between transforms practically.
   c) Reconstruct the input from the transformed series obtained in (b) using IDCT and IFFT.

2. Task 2
   a) What are the main blocks of JPEG2000 encoder in Figure 1? Explain the methods and give the differences from the JPEG encoder.
   b) How DPCM is used in JPEG2000?

3. Task 3
   Assume that class conditional probability density function of feature $X$ is given in Figure 2 for category $\omega_1$ and $\omega_2$. Prior probabilities of the categories are $P(\omega_1) = 0.3$ and $P(\omega_2) = 0.7$ respectively.
   a) Calculate the posterior probabilities for the two categories using Bayes formula for feature value $X = 2$.
   b) Calculate the probability of error for two categories.
   c) Classify the feature pattern with the minimum error rate rule for two categories.

Figure 1: Main blocks of the JPEG2000 encoder

Figure 2: Class conditional probability functions for categories $\omega_1$ and $\omega_2$. 