Subject

$x[n] = [18, 18, 20, 24, 19, 22, 22, 23]$ $n = 0, 1, \ldots, 7$

The DFT is computed as:

$$X[K] = \sum_{n=0}^{7} x[n] e^{-i \frac{2\pi}{8} Kn}, \quad K = 0, 1, \ldots, 7$$

$$X[0] = \sum_{n=0}^{7} x[n] = 18 + 18 + 20 + 24 + 19 + 22 + 22 + 23 = 166$$

$$X[1] = \sum_{n=0}^{7} x[n] e^{-\frac{\pi}{4} in} = -2.05 + 3.39i$$

$$X[2] = \sum_{n=0}^{7} x[n] e^{-i \frac{\pi}{2} n} = -1.5i$$

$X[3] = 4.05 - 1.39i$

$X[4] = 6$

$X[5] = 4.05 + 1.39i$

$X[6] = -1 + 5i$

$X[7] = -2.05 - 3.39i$

$$a_0 = \frac{1}{8} \sum_{n=0}^{7} x[n] = 20.75$$

$$a_K = \frac{2}{8} \sum_{n=0}^{7} x[n] \cos\left(\frac{2\pi Kn}{8}\right)$$

$$b_k = \frac{2}{8} \sum_{n=0}^{7} x[n] \sin\left(\frac{2\pi kn}{8}\right)$$

Approximate Fourier

$$y(x) = 20.75 + \sum_{k=1}^{N} \left(a_k \cos\left(\frac{2\pi kn}{8}\right) + b_k \sin\left(\frac{2\pi kn}{8}\right)\right)$$

$$y(x) = 20.75 - 0.512 \cos\frac{\pi x}{4} - 0.847 \sin\left(\frac{\pi x}{4}\right) + \ldots$$