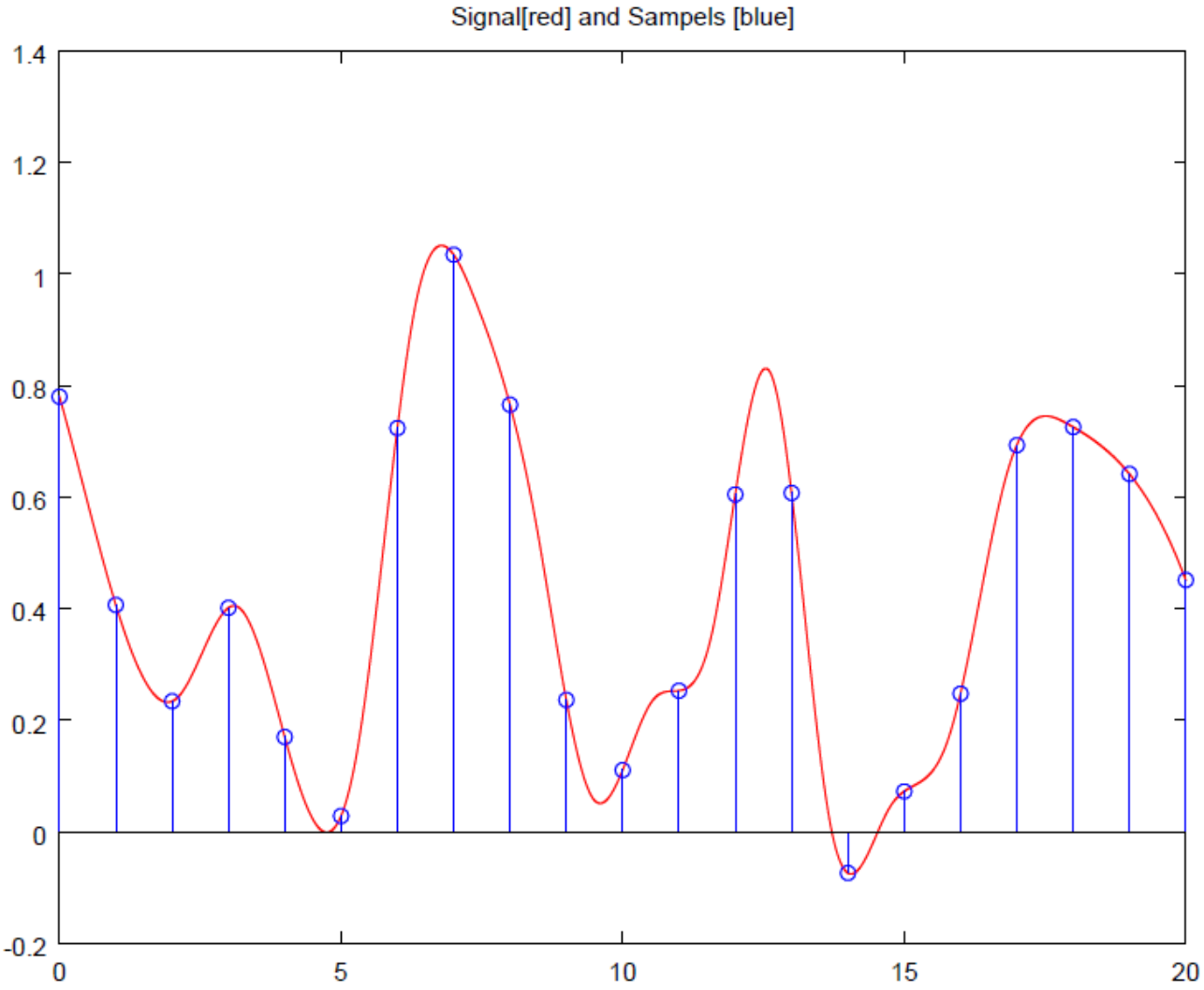
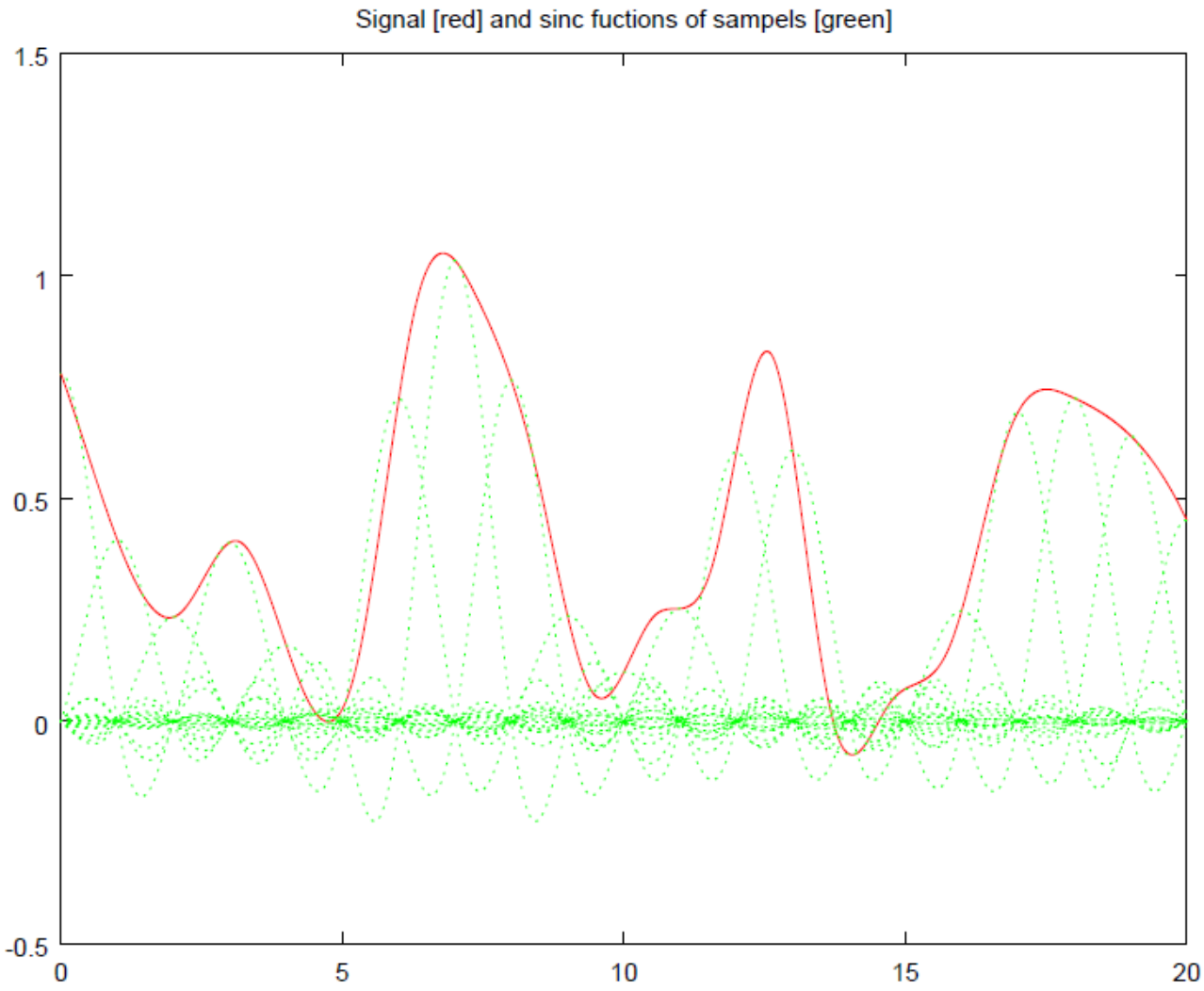
Exercise 8.3

1. Read in the *.mat file and extract Fs and signal out of the struct
   The signal is 20 seconds long and has 160000 points
   Fs = 8000
2. Sample over the signal
   We take one sample each second so we have 21 samples

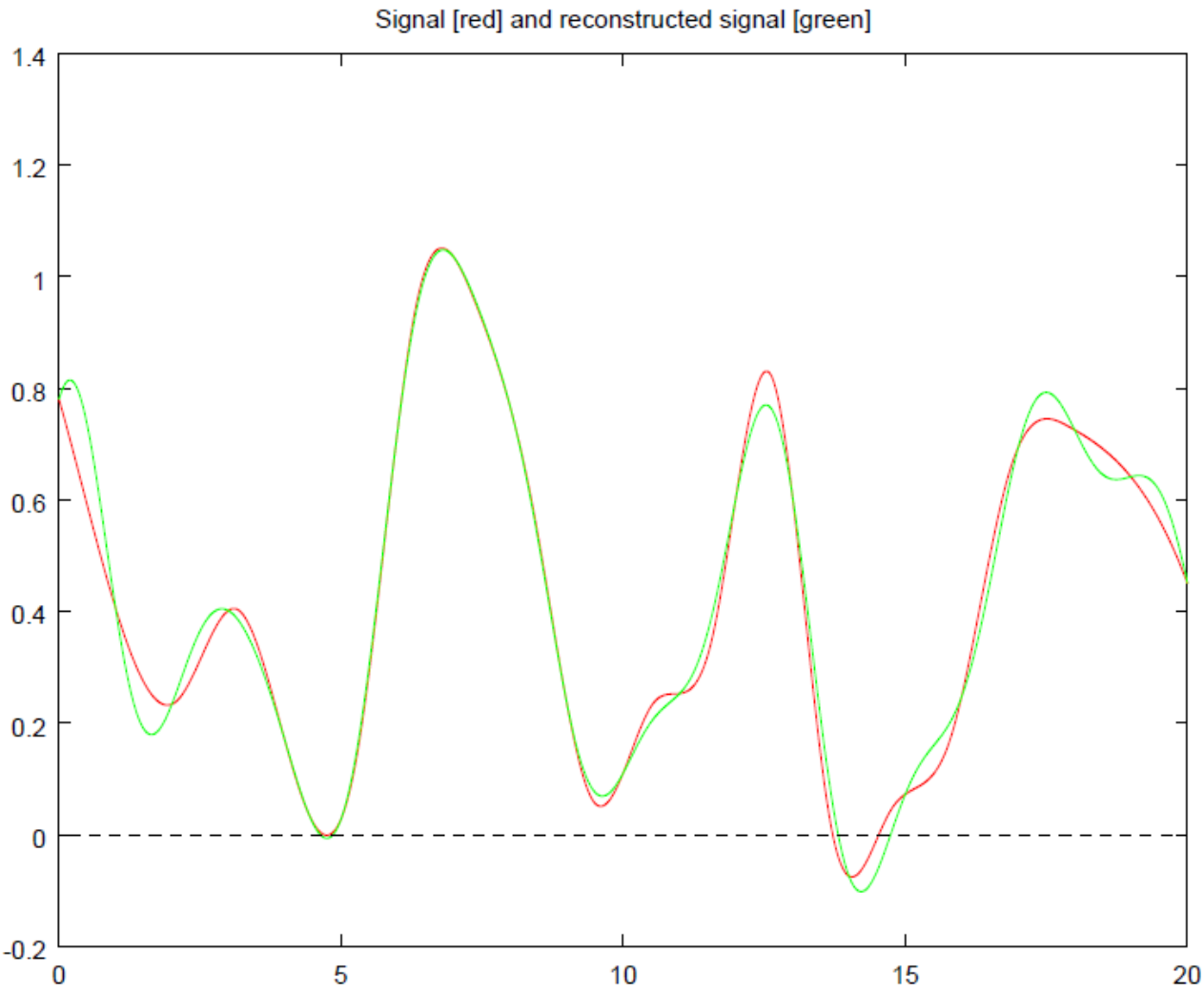


3. Calculate for each sample the sinc function
   t = [0:20],
   Time_sample := second where the sample was taken (shift the sinc function),
   amplitude_sample := amplitude of signal at Time_sample (weighted the sinc function)

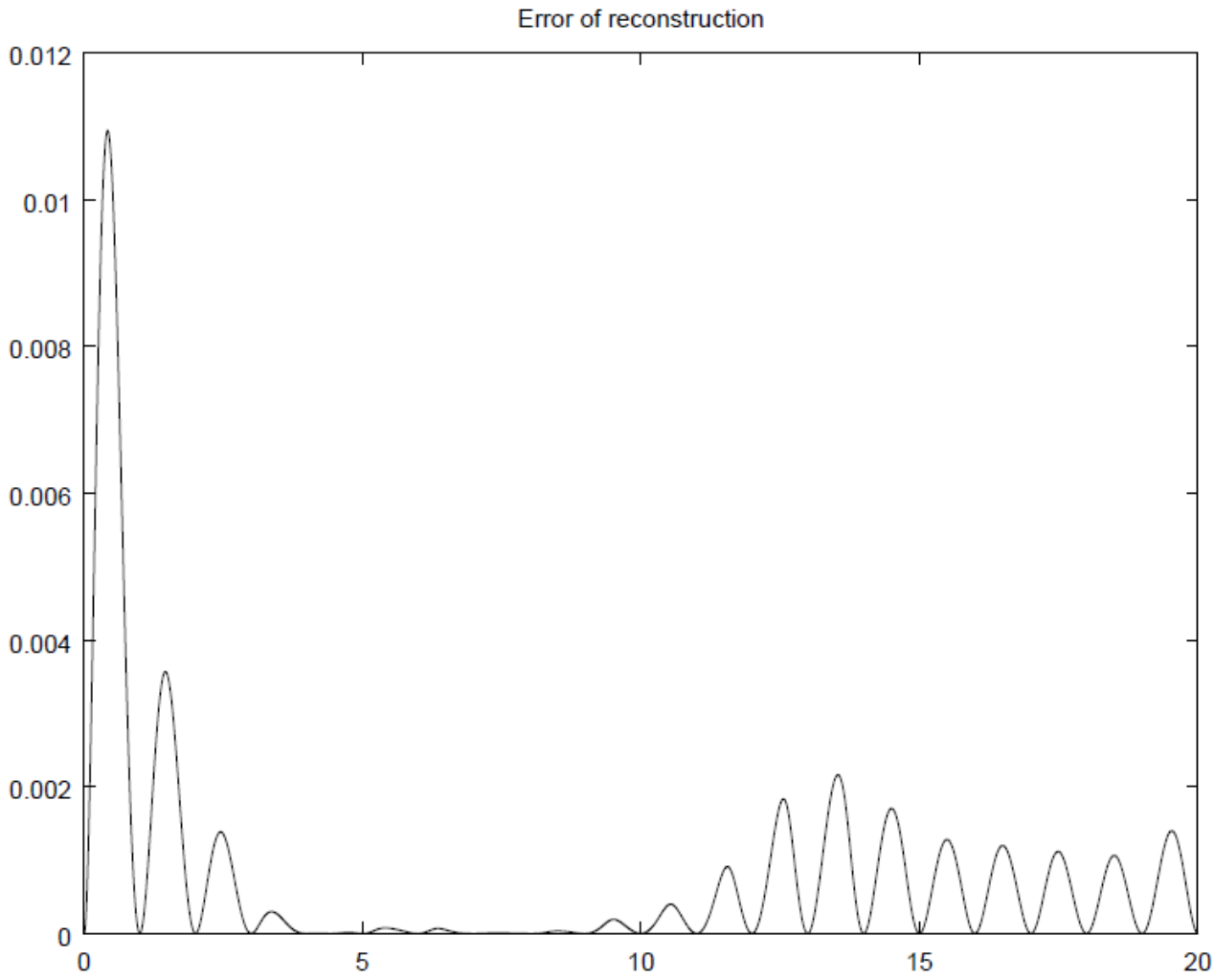
   y = amplitude_sample * sinc(t-Time_sample)



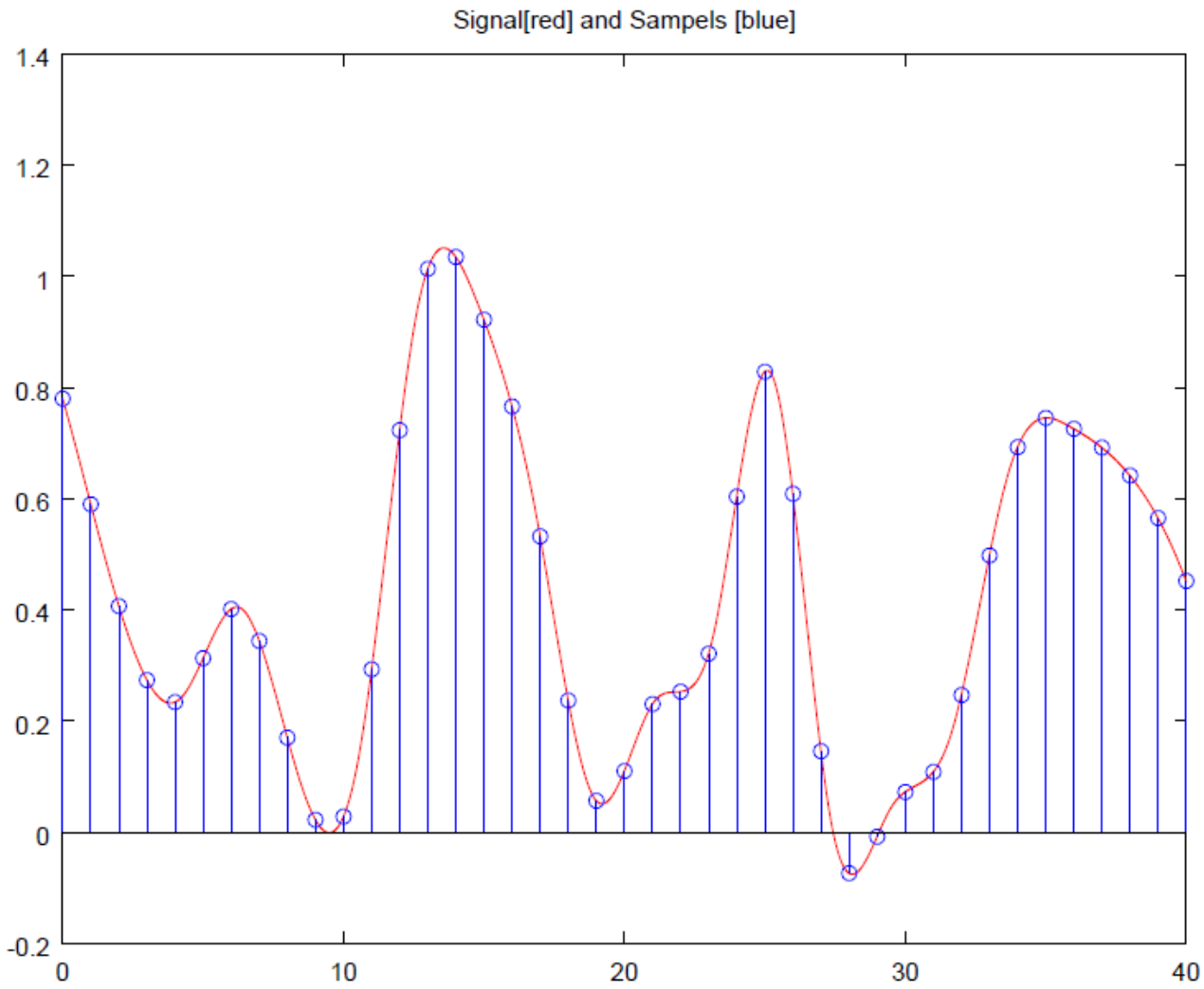
4. Sum up all sinc functions to reconstruct the original signal

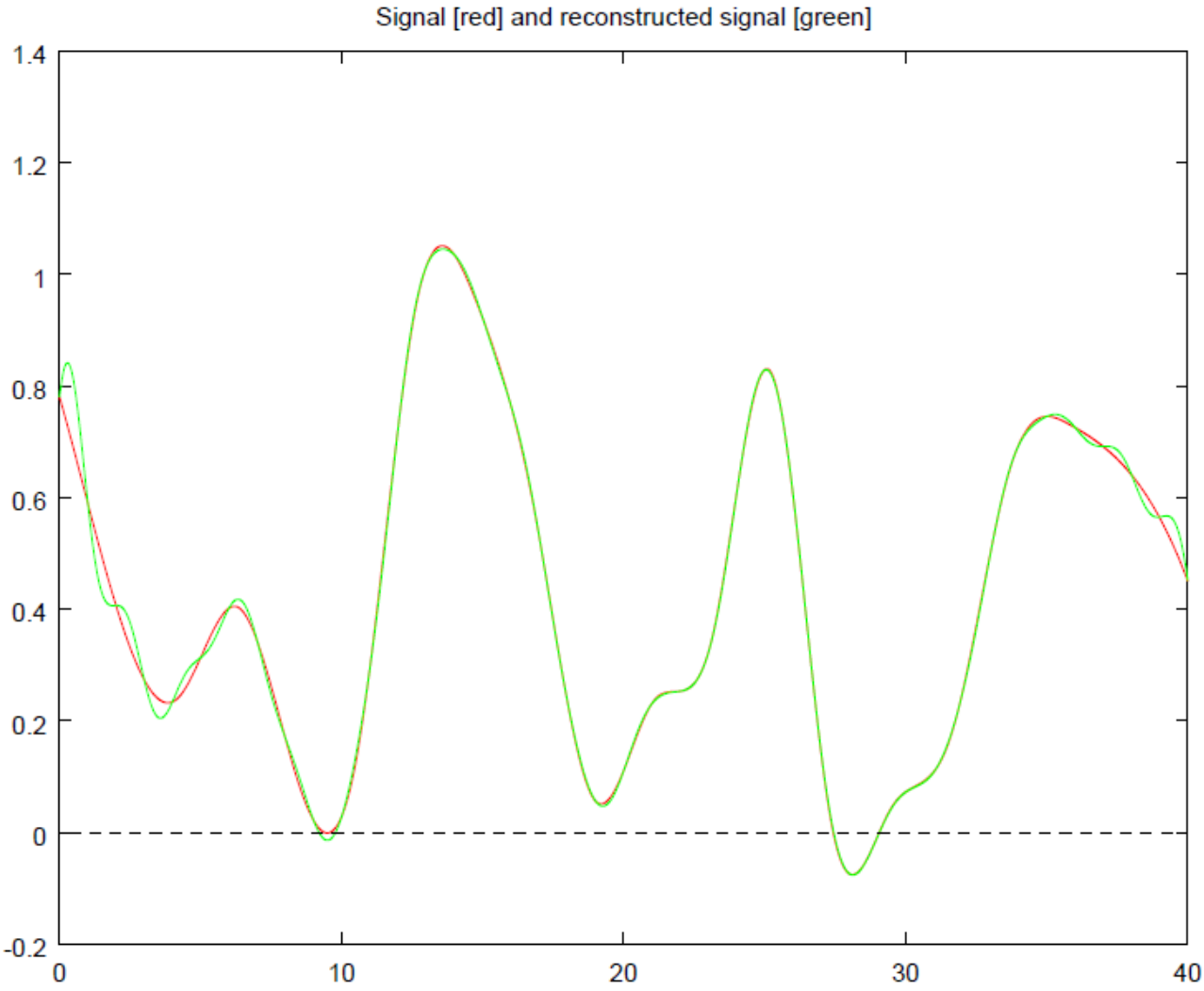


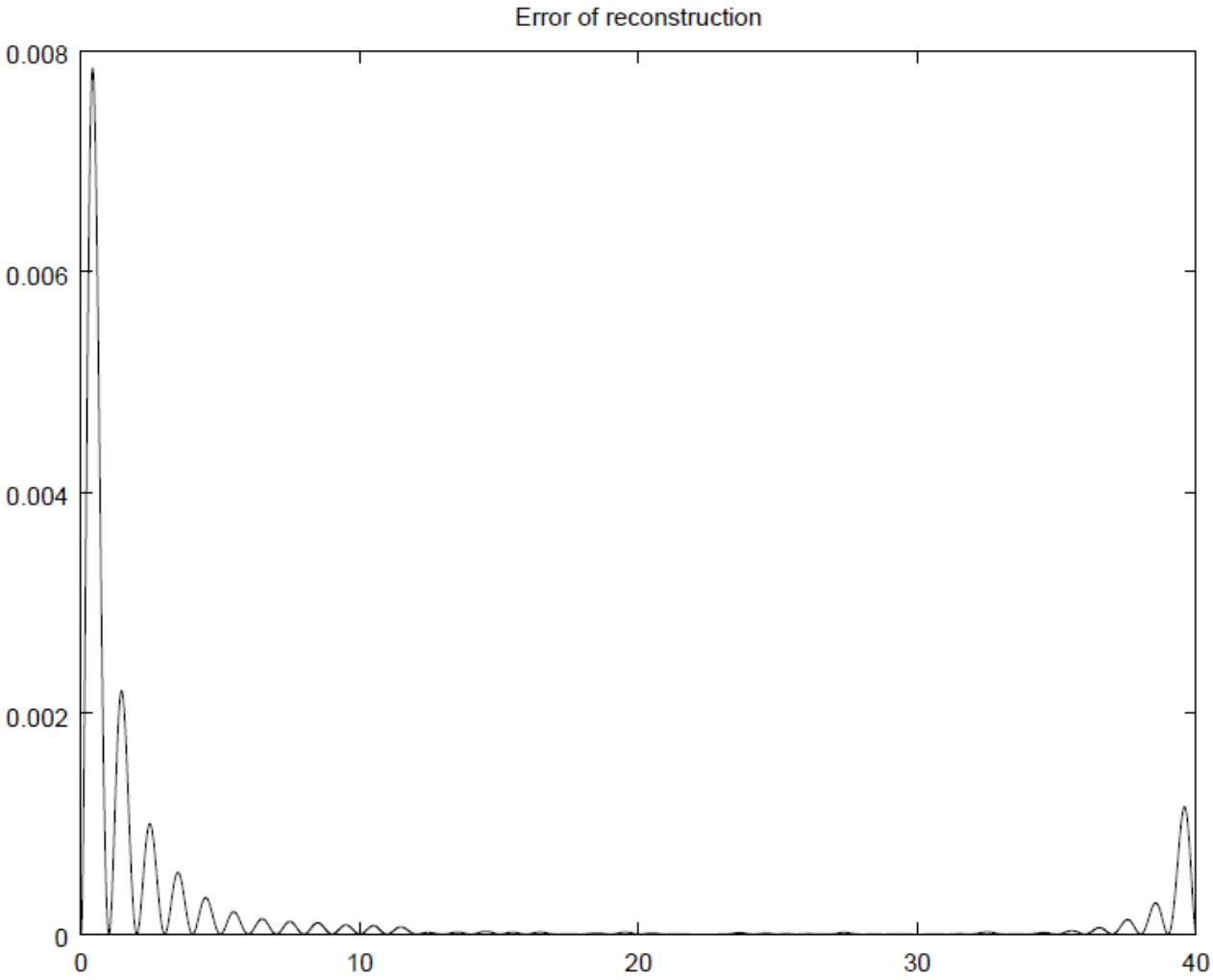
5. Calculate the error of the reconstruction
   error = 0.5 * abs(signal - reconstruction)^2



If we double the sample size, the reconstruction of the signal is significant better


Signal[red] and Sampels [blue]
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
0
10
20
30
40


Signal [red] and reconstructed signal [green]
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
0
10
20
30
40


Error of reconstruction
0.008
0.006
0.004
0.002
0
0
10
20
30
40