

CS1031: Lab#1

In the first lab we will approximate some functions with sum of sine functions following the Fourier series.

The functions you want to plot are:

1. The square wave:

build a 6 subplot figure to show the time domain, and use respectively 1, 3, 5, 10, 50, 500 frequencies. Each plot should have overlapped the real square function on a different color. Remember to use a step of minimum 0.01 for the x axis.

The Fourier series of the square wave is given by $\frac{4}{\pi} * \sum_{k=1, k=odd}^n \frac{\sin(2\pi kt)}{k}$

Notice that the iteration is only done through the odd numbers, do your For loop will need to start from 1 and advance at step of 2, for example "for i=1:2:50".

The square wave to be plotted in red is given by 'square(2 * pi * x)'.

Hint:

The following Matlab syntax might be useful. If you want to draw the 6 figures automatically using an outer For loop, you can iterate the loop over specific values (say: 1,3,5,10,50,500) in this way:

"for i=[1,3,5,10,50,500]

... code inside the loop that uses the variable i with the values in the bracket above...

end;"

You will find all the required Matlab commands in the Matlab tutorial.

The graphs should look like the following:

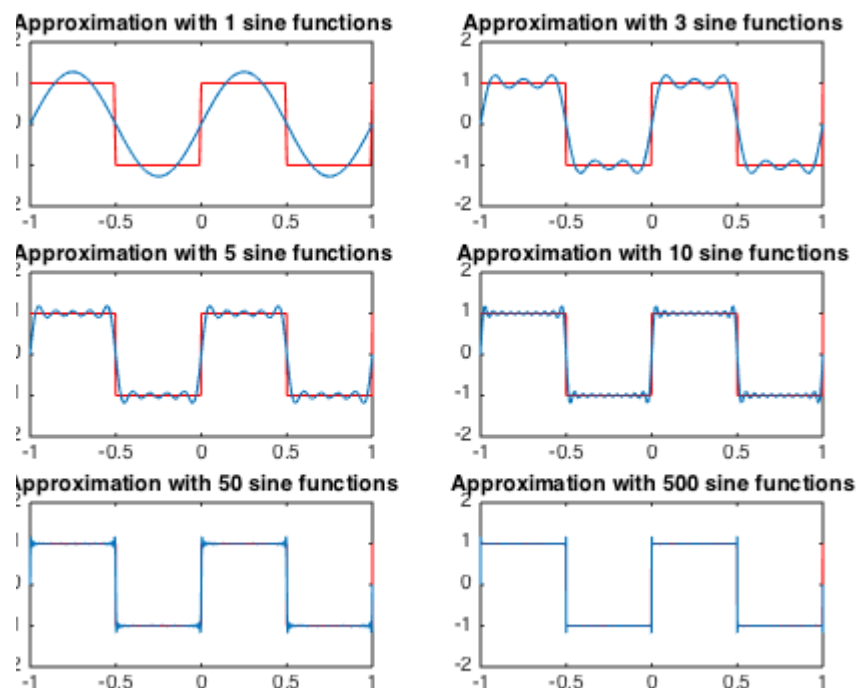


Figure 1: Square wave approximation in time

2. Draw the representation in the frequency domain of the square wave approximation in exercise 1). For this you will need to do a stem plot, where each line represents the amplitude of each sine wave on the sum. The plot will show all such amplitudes, in sequence. The graphs should look like the following:

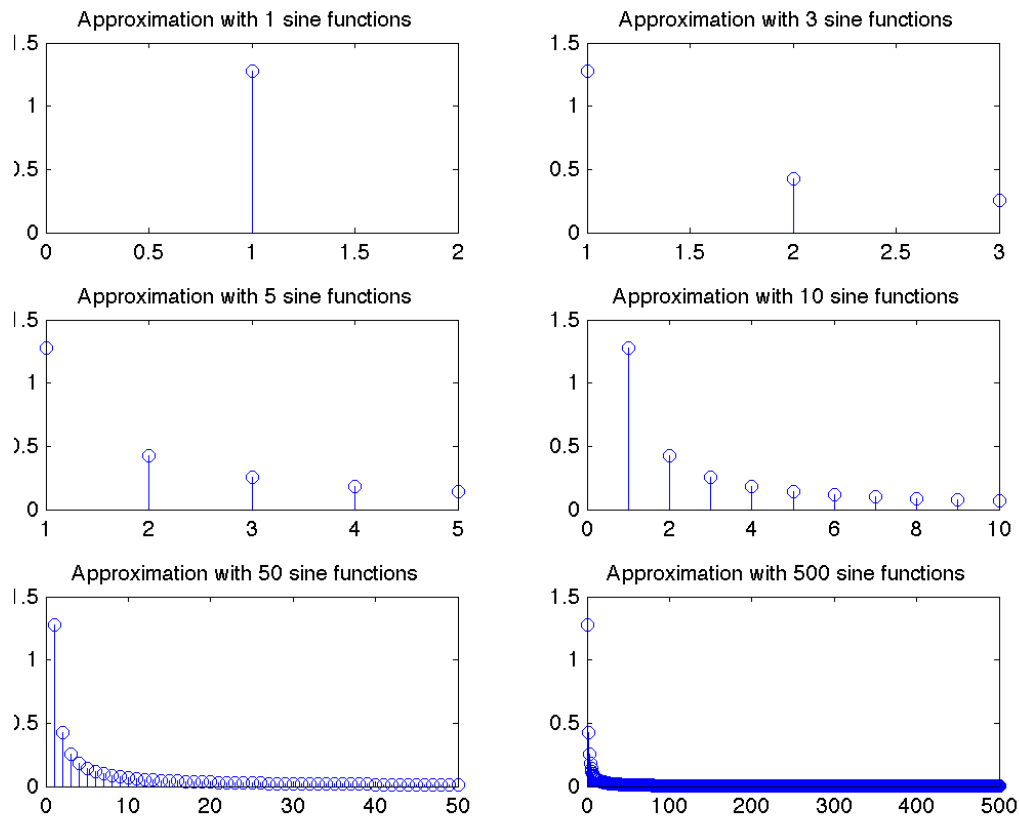


Figure 2: Square wave approximation in frequency