Laboratory work 3
STUDYING OF PULSES AND RANDOM SIGNALS

B) Non-linear system

A non-linear system causes harmonic distortion (harmonics of the frequencies) into the original signal and often intermodulation distortion (new frequencies), too. All active systems (amplifiers) are non-linear but correctly designed ones produce only little distortion. However, for instance in radio transmitters a bandpass filter is used before the antenna, so that the unwanted frequencies are attenuated.

In the preliminary questions a sum of cosine and sine wave was fed into the non-linear system and the output was calculated. Now it is time to do the same in Matlab. ● Open a Matlab macro from the directory, which assistant gave you. Make the changes needed. The instructions will be found in the macro that you can print if you want.

● Save the macro into d:\sinkut and run it in Matlab. Change the scales and titles if needed. Print the graphs.

● Compare the results with those you calculated in the preliminary questions. Similarities and differences? Interpret the possible differences. You can zoom the graphs if more accurate values are needed.

@ Calculate the distortion attenuation and total distortion of frequencies f1 and f2 (so only the harmonics of f's are taken account, not the intermodulation results).
● If you didn't zoom in the previous question, then now it's time to do it so that you can get accurate enough answer to the @-question!

● At the Matlab's command prompt, calculate the mean values, standard deviations, variances and total powers (assuming that the impedance of the load is 1 ohm).

Statistical quantity	Matlab command	xt	yt
Mean value	m = **`mean(xt)`**		
Standard deviation	d = **`std(xt)`**		
Variance	v = **`d^2`**		
Total power	p = **`m^2+v`**		

● Let the assistant check the results before continuing!