

Exercise 3 of Assignment 2 (due 1/23/08)

Consider a periodic function $g_p(\cdot)$ with a period of $T = 2$ such that

$$g_p(t) = e^{a|t|}, \quad -1 < t \leq 1,$$

where a is a nonzero real-valued constant.

- a) What are the Fourier coefficients for this function?
- b) What is its discrete power spectrum?
- c) Determine the m th order Fourier series approximation $g_{p,m}(\cdot)$ to $g_p(\cdot)$.
- d) (Extra credit) Create plots (similar to those in Figure 61) showing how well $g_{p,m}(\cdot)$ approximates $g_p(\cdot)$ for $m = 2, 4, 8$ and 16 when $a = -1$.

You might find the following indefinite integral useful:

$$\int e^{ax} \cos(px) dx = e^{ax} \frac{a \cos(px) + p \sin(px)}{a^2 + p^2}$$