

1. Use the definitions:

$$\begin{aligned}f_e[x] &= f_e[-x] \\f_o[x] &= -f_o[-x]\end{aligned}$$

to derive the expressions for the even and odd functions.

2. Consider two spatial sinusoids with the same spatial frequency ξ_0 but arbitrary amplitudes A_1 and A_2 and arbitrary phases ϕ_1 and ϕ_2 :

- (a) Prove that the sum of these two sinusoids is a sinusoid with that same frequency ξ_0 .
- (b) Find the expression that relates the amplitude A and phase ϕ of the summation sinusoid.

3. For a sinusoidal functions whose phase is a power of the coordinate:

$$f[x] = \cos \left[\pi \left(\frac{x}{\alpha} \right)^n + \phi_0 \right]$$

- (a) Graph the function in the three cases $n = 1$, $n = 3$, and $n = 4$; in each assume that $\alpha = 1$ and $\phi_0 = +\frac{\pi}{4}$,
- (b) Find the equation for the spatial frequency of $f[x]$ for all values of n .
- (c) Determine the dimensions of the parameter α for all values of n .