

Complex Fourier Series

$$f(x) = \sum_{n=-\infty}^{n=\infty} C_n e^{in\omega x}$$

Where $C_n = \frac{1}{T} \int_d^{d+T} f(x) e^{-in\omega x} dx$

Question:

$$f(x) = \begin{cases} -1 & -\pi \leq x < 0 \\ 1 & 0 \leq x < \pi \end{cases} \quad f(x+2\pi) = f(x)$$

$$T = 2\pi$$

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function [cseries] = complex_series(K, T)

n = -K:K;
omega = 2 * pi / T;

syms x;
f1 = -1;
f2 = 1;

cn = (1/T) .* (int(f1 * exp(-1i * n * omega * x), x, -pi, 0) + int(f2 * exp(-1i * n * omega * x), x, 0, pi));

cseries = sum (cn .* exp(1i * n * omega * x));

disp('Complex Series is : ');
disp(vpa(cseries, 10));

end
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