

Mathematical Method of Physics

Problem 4

4.1 Find the following integrals in terms of their principal values:

a)

$$\int_{-\infty}^{+\infty} dx \frac{1}{x(x^2 + 1)},$$

b)

$$\int_0^{+\infty} dx \frac{1}{x^2 - a^2}.$$

4.2 Expand $f(x) = A \operatorname{sgn}(x)$, where $|x| < L$, in Fourier series.

4.3 Expand $f(x) = |\sin(x)|$ in Fourier series.

4.4 Expand $f(x) = Ax^2 + Bx + C$, where $-\pi < x < \pi$ and A , B and C are constants, in Fourier series.