Notes on FFTLog

Xiao Fang

1 Problem Description

The integral we are solving is

$$F(y) = \int_0^\infty \frac{dx}{x} f(x) j_\ell(xy) \ , \tag{1}$$

where $f(x)$ is an input of array, j_ℓ is the order-ℓ spherical Bessel function of the first kind. This type of integrals are numerically challenging due to the rapidly oscillitary nature of the spherical Bessel functions, especially when the input $f(x)$ data array correspond to sampling array x over a large range (*i.e.*, over several orders of magnitude).

2 Efficient Computation with FFTLog

The essential idea is to expand $f(x)$ into a series of power-laws and solve each component integral analytically.