

The Mellin Transform and its Inverse

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1 The Mellin Transform

The Mellin transform is an integral transform that maps a function $f : \mathbb{R}_+ \rightarrow \mathbb{R}$ onto a function \mathcal{M}_f on the complex plane, defined by

$$\mathcal{M}_f(s) := \int_0^\infty f(x) t^{s-1} dx \quad \text{for } s \in \mathbb{C}.$$

Besides applications in several mathematical areas like numerical analysis and differential equations, the Mellin transform also occurs in various problems in physics and computer science. Our main interest lies in its use in computerized tomography, see [1]. For the investigation of properties of the Mellin transform and calculations of Mellin transforms of given example functions, tools from complex analysis may be used.

2 Aims of the thesis

The aim of the thesis is to study the properties of the Mellin transform, and to treat the question of inversion of the Mellin transform both analytically and numerically on selected examples arising in the field of Radon transforms.

References

- [1] F. Natterer. *The mathematics of computerized tomography*, volume 32 of *Classics in Applied Mathematics*. Society for Industrial and Applied Mathematics (SIAM), Philadelphia, PA, 2001.
- [2] Alexander D. Poularikas. *Transforms and Applications Handbook, Third Edition*. Electrical Engineering Handbook. CRC Press, 2010.