Roger Penrose says that according to the excision theorem the notion of a hyperfunction (f, g) is independent of the regions on which f and g are defined.

The excision theorem is an algebraic topology theorem that's applied here to cohomology groups on sheaves. It is probably not very complicated at heart, but there's an "Introduction to the theory of hyperfunctions" by Hikosaburo Komatsu which has a more basic proof, using the Mittag-Leffler theorem in complex analysis. He uses a variant of the usual Mittag-Leffler theorem, which is proved in a very dense small book - a neutron star of books, "An introduction to complex analysis in several variables" by Lars Hörmander. It was this that got me started reading multivariable complex analysis.

Enjoy! Komatsu's explanation by comparison is quite lucid, almost light reading.

When Komatsu writes in equation 2.3, $[F] = F(x + i0) - F(x - i0)$ I think what he means by $F(x + i0)$ is the limit that F approaches as you go towards x in the $-i$ direction.