Contour Integration References and Links

In the discussion of the inverse Laplace transform in Section 1.6, I mention that in practice the inverse transform is often found using methods such as table look-up rather than evaluating the integral given in Eq. 1.25:

$$f(t) = \mathcal{L}^{-1}[F(s)] = \frac{1}{2\pi i}\int_{\sigma-i\infty}^{\sigma+i\infty} F(s)e^{st}ds.$$

This integral, taken over a vertical line in the region of convergence of the Laplace transform in the complex plane, is called the Bromwich integral, and it can be evaluated using the method of contour integration.

You can find an introduction to contour integration by Y.D. Chong on LibreTexts:

> Contour Integration. (2021, November 25). Nanyang Technological University. https://phys.libretexts.org/@go/page/34565

and the following texts contain many examples of the use of contour integration applied to the inverse Laplace transform:

> Dyke, P., *An Introduction to Laplace Transforms and Fourier Series*, Section 8.5 (Springer, Second Edition, 2014) ISBN-13: 978-1447163947
>
> LePage, W.R., *Complex Variables and the Laplace Transform for Engineers,* Section 10-19 (Dover, 2010) ISBN-13: 978-0486639260
>
> Spiegel, M., *Laplace Transforms (Schaum's Outlines)*, Chapter 5 "Complex Variable Theory" and Chapter 7 "The Complex Inversion Formula" (McGraw-Hill, 1965) ISBN-13: 978-0070602311.

Contour integration in the context of complex variable theory is discussed in these comprehensive mathematical methods texts:

> Riley, K.F., Hobson, M.P., and Bense, S.J., *Mathematical Methods for Physics and Engineering,* Chapter 24 "Complex Variables" and Chapter 25 Section 25.4 "Inverse Laplace Transform" (Cambridge University Press, Third Edition, 2006) ISBN-13: 978-0521679718
>
> Arfken, G., Weber, H., and Harris, F., *Mathematical Methods for Physicists*, Chapter 11 "Complex Variable Theory" and Chapter 20 Section 20.10 "Inverse Laplace Transform" (Academic Press, Seventh Edition, 2012) ISBN-13: 978-0123846549.
>
> Boas, M., *Mathematical Methods in the Physical Sciences*, Chapter 14 Section 3 (Contour Integrals) and the Subsection called "Bromwich Integral (Inverse Laplace Transform)" in Section 6 (Wiley, Third Edition, 2005) ISBN-13: 978-0471198260.