Visible and invisible waves are all around us. Fourier transforms allow us to break waves, or any periodic function, into unique sinusoidal expressions, allowing for more accessible analysis and study. Fourier transforms are used in applications such as CAT scans, data compression, and quantum mechanics, just to name a few.

This book is a self-contained guide to Fourier transforms. It includes a review of required material such as trigonometric identities and arithmetic involving complex numbers, making it accessible to someone early in their math journey. Topics in this book are explained in a clear, informal fashion with many visual aids that support the ideas discussed. The book does not include any proofs, and instead focuses on providing the reader with an understanding of how Fourier transforms work and what they are used for. The book begins with a discussion of how to find the Fourier transform for a real-valued function and then repeats the process for complex-valued functions. Equipped with this information, the author explains how Fourier transforms are applied in fields such as data compression and quantum physics. Interested readers may access a GitHub repository containing Python and MatLab code for various examples.

The Fourier Transform is well-suited to someone who wants to know what Fourier transforms are, their mathematical structure, and some examples of how they are used. At a minimum, someone reading this book would need to have completed two semesters of calculus. More advanced undergraduates or mathematicians interested in understanding some basics about Fourier transforms would still find this a valuable read and would be able to skip the sections with review content in them.

What’s the Use
How Mathematics Shapes Everyday Life
By Ian Stewart

Most of us have had the experience of being met with negativity when we tell someone that we are a mathematician. In addition, we have all had the experience of students reacting to a required course or even a topic within a course by asking “When will I ever need this?” Thanks to Stewart’s engaging book, we have a plethora of relevant examples to add to our artillery of responses.

What’s the Use focuses on instances where math has been applied to solve a problem that it was not developed to solve. For example, there is a chapter dedicated to the ways in which space-filling curves, which were discovered in the 1890s, are currently being used to help Meals on Wheels deliver meals. Stewart acknowledges that as technology has advanced, often using math in the background, it has become easier for people to dismiss math as obsolete. Throughout the book he works to show this is not the case, giving examples of how math is used to help make CGI motion smooth and to develop medical imaging techniques, among many other applications. In doing so, he touches on graph theory, number theory, and quantum mechanics, to name a few.

This book is a great read for anyone, regardless of mathematical background, interested in how mathematics is applied in critical ways on a daily basis. It is not mathematically deep and would be an excellent companion read to any liberal arts math course as it shows students how the topics they are learning (such as the bridges of Konigsberg) are connected to modern uses of math (like navigating the kidney transplant list). It can also be used as inspiration for outreach programs with an aim of exposing people to math topics that are relevant and easy to motivate yet outside the standard K–12 curriculum.