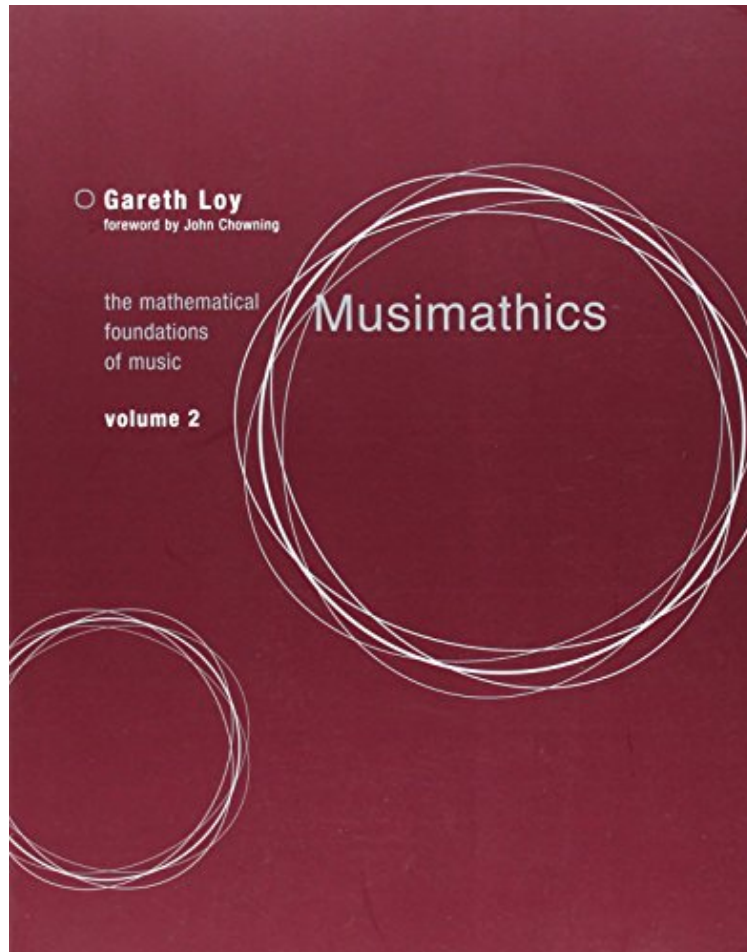


[Free pdf] Musimathics: The Mathematical Foundations of Music (MIT Press) (Volume 2)

## Musimathics: The Mathematical Foundations of Music (MIT Press) (Volume 2)

Gareth Loy

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**Gareth Loy : Musimathics: The Mathematical Foundations of Music (MIT Press) (Volume 2)** before purchasing it in order to gage whether or not it would be worth my time, and all praised Musimathics: The Mathematical Foundations of Music (MIT Press) (Volume 2):

29 of 30 people found the following review helpful. Extraordinary Beyond the Title, a must for all Math LoversBy Let's Compare Options PreptorialThe sad thing about this series is that the keywords that invite readers to stop by, hide the fact that these texts go far beyond music, to USE music as a gentle introduction to extremely complex, relevant and timely math concepts. The best teachers use four paths to explain a math concept: verbal, formulaic, algorithmic and pictographic. These help the brain comprehend the topic regardless of our learning modality. The authors here are simply MASTERFUL math teachers, and clarify everything from Eulers Law (relation of e, the base of the natural logarithms to pi, the base of the trig functions) to Fourier Transforms, in a way that a bright High School student will

get. If you've been out of math (any math) for a long time, and want a masterful review of math concepts and techniques, this series is THE place to start. You can then extend that foundation to many other applied areas, from signal processing to physics, voice recognition, etc. Fourier transforms (and their more recent spin off in Cepstrums) are being used in too many fields to list today, from radar and electronic engineering, to whale songs. In every section, the author's excitement is contagious. Rather than give a bunch of dry proofs that reek of hubris and disregard for the reader, Gareth uses a "curious mind" tone, as if he were just learning and discovering this too, like a kind of puzzle or murder mystery. Loy is Monk, Holmes and Columbo combined. For example, he gives a few expansion series for  $e$ , then says: "Wow, there seems to be a striking and beautiful pattern here, doesn't there? Wonder what it can be?" Leave it to a guy into both math and music to see the wonder in a time series! One more example. Any texts on waveforms have to involve deep calculus, especially PDE's. Unfortunately, deep PDE's don't happen until grad school. But, rather than assume the reader uses calculus all day long, Loy starts with the basics at "now let's see how the first derivative is actually slope finding and integration is the area covered by the moving curve..." including those perhaps more musically inclined who have forgotten what a derivative is. Astonishingly, Loy sneaks around the dry topic of limits to use MUSIC as a great practical refresher on calculus (p. 263 of the second volume, in the section that is the hottest topic in Physics today, from Astronomy to Medical Imaging to of course music: Resonance). Gareth is one of the few mathematicians around who can relate math to the astonishment of life around us. After all, our brain is doing advanced Fourier Transforms every time we cross a street in traffic, and when we get an MRI, the Fourier Transforms that convert magnetic alignment to pictures are assuming that the atoms in our body are a song, which when pulsed with a radio wave, will sing the positions of their water molecules back to us in harmonics that can be seen as well as heard. Highly recommend this series, not only for everyone interested in math and music, but math and life!

0 of 0 people found the following review helpful. Advanced and well done  
By F. Ehorn  
This second volume is very much a detailed lesson in spectral analysis. The examples and graphics are very good. You will need a very solid background in college math to follow everything presented. If you have never heard the words, 'Fourier transform', it will be over your head.  
1 of 1 people found the following review helpful. the Math - if you're a musician with a technical bent  
By John\_G  
This is the Math - if you're a musician with a technical bent. There's two books in the series and I recommend both.

The second volume of a commonsense, self-contained introduction to the mathematics and physics of music, focusing on the digital and computational domain; essential reading for musicians, music engineers, and anyone interested in the intersection of art and science. Volume 2 of Musimathics continues the story of music engineering begun in Volume 1, focusing on the digital and computational domain. Loy goes deeper into the mathematics of music and sound, beginning with digital audio, sampling, and binary numbers, as well as complex numbers and how they simplify representation of musical signals. Chapters cover the Fourier transform, convolution, filtering, resonance, the wave equation, acoustical systems, sound synthesis, the short-time Fourier transform, and the wavelet transform. These subjects provide the theoretical underpinnings of today's music technology. The examples given are all practical problems in music and audio. Additional material can be found at <http://www.musimathics.com>.

From his long and successful experience as a composer and computer-music researcher, Gareth Loy knows what is challenging and what is important. That comprehensiveness makes Musimathics both exciting and enlightening. The book is crystal clear, so that even advanced issues appear simple. Musimathics will be essential for those who want to understand the scientific foundations of music, and for anyone wishing to create or process musical sounds with computers. (Jean-Claude Risset, Laboratoire de Mécanique et d'Acoustique, CNRS, France)

Volume 1 of Musimathics is the ideal introduction to the science of musical acoustics and composition theory, and volume 2 succeeds as no other tutorial does in making the theory of computer music and digital signal processing accessible to a broad audience. Loy's typically careful treatment leads to a book that combines readability and fun with exhaustive and meticulous coverage of each of the topics he addresses. It can serve equally well as an introduction and as a desk reference for experts. (Stephen Travis Pope, CREATE Lab, Department of Music, University of California, Santa Barbara)

Music and mathematics enjoy many points of intersection. Just think of musical scales and number theory, or the impact of computers - both analog and digital - on the composition and creation of musical sounds. The second volume of Musimathics ably covers these and many other instances of this happy union: Fourier and wavelet transforms, natural and artificial reverberation, and much more. (Manfred Schroeder, Professor of Physics, University of Goettingen)

About the Author  
Gareth Loy is a musician and award-winning composer. He has published widely and, during a long and successful career at the cutting edge of multimedia computing, has worked as a researcher, lecturer, programmer, software architect, and digital systems engineer. He is President of Gareth, Inc., a provider of software engineering and consulting services internationally.