The Lemniscate and Elliptic Functions

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Abstract

Finding the points that divide a certain curve in $\mathbb{R}^2$, the lemniscate, into equal segments leads us to a function that is the inverse of an integral. This function turns out to be a doubly periodic function of a complex variable, also known as an elliptic function. There are powerful consequences of the function being doubly periodic which allow us to translate the problem of finding the division points for the lemniscate into the problem of finding roots of certain polynomials. Time permitting, we will also go over properties of elliptic functions in general and some other examples.

Prerequisites

Understanding of the fundamentals of calculus

For some parts, it will be useful to know some complex analysis, but not critical.

References

[1] A.I. Markushevich, *Theory of Functions of a Complex Variable*, Vol.2, The American Mathematical Society, Rhode Island, 2005. **Chapters 4 & 5**

[2] J. E. Marsden, M.J. Hoffman, *Basic Complex Analysis*, W.H: Freeman, 1998. **Chapter 2.**

[3] D.A. Cox. *Galois Theory. John Wiley & Sons*, New Jersey, 2012. **Chapters 10 & 15.**