# Tools for Teaching Computational Mathematics

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## Statement of Originality

This work contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. I give consent to this copy of my thesis, when deposited in the University Library, being made available for loan and photocopying subject to the provisions of the Copyright Act 1968.

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## Thesis by Publication

I hereby certify that this thesis is in the form of a pair of published books of which I am a joint author. I have included as part of the thesis a written statement from each co-author, endorsed by the Faculty Assistant Dean (Research Training), attesting to my contribution to the joint publications.

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## Statement of Contribution

I, Jonathan M. Borwein, attest that Master of Philosophy (Mathematics) candidate Matthew P. Skerritt was the principal author of the publications entitled "An Introduction to Modern Mathematical Computing with *Maple*" and "An Introduction to Modern Mathematical Computing with *Mathematica*" and wrote the full draft of both texts.

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# Abstract

So called "computer algebra" or "symbolic computation" systems such as Maple, and Mathematica have become complete mathematical computation workspaces with a large and constantly expanding built-in "knowledge base". They aim to provide exact mathematical answers to mathematical questions, and have opened the way for so called "experimental" computer-assisted mathematics in both the pure and applied fields. Furthermore, it has been only recently (perhaps the last 5 to 10 years or so) that personal computers have been quick enough that one might feasibly experiment with mathematics applicable to a second year student at a cognitively satisfying speed for the learner. The author has designed a second year mathematics course to introduce students to computer algebra systems, and has written textbooks to go with the course: "An Introduction to Mathematical Computing with Maple"[1], and "An Introduction to Mathematical Computing with Mathematica"[2]. We discuss the process of creation of both the course and the books, and the differences between our approach, and prior approaches.

[1]ISBN: 978-1-4614-0121-6, URL: `http://www.springer.com/mathematics/book/978-1-4614-0121-6`
[2]ISBN: 978-1-4614-4252-3, URL: `http://www.springer.com/mathematics/book/978-1-4614-4252-3`

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