



INTERNATIONAL CENTRE  
OF EXCELLENCE FOR  
EDUCATION IN  
MATHEMATICS

**Laplace Transforms and Spectra**  
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For my summer vocational project I worked with Associate Professor Alan Pryde. My project consisted of two parts. The first part was working through an undergraduate course on complex analysis. The second, and major part of the project, was giving a detailed proof of an example from one of my supervisors paper.

The example was:

Example:  
Let  $\varphi(t) = e^{it^2}$ ,  $t \in \mathbb{R}$ .  
Then  $\text{sp}^2(\varphi) = \emptyset$

The outline of the proof in the original paper was 9 lines long. The final copy of my proof was close to 9 pages. I was particularly excited by the amount of work it took to show that something was nothing!

Throughout the project we used a text called "Complex Analysis" by Stewart and Tall. I enjoyed the problem a lot as I was required to use some strategies from first, second and third year maths; integration by parts, integration factor method of solving differential equations, as well as techniques I learnt while working through the project with Alan; complex analysis skills in particular.

I felt the project was at an appropriate level, challenging without being overly daunting. By doing the project I strengthened my analysis techniques and gained a much deeper understanding of complex numbers and functions.

I feel that I now have a broader knowledge of maths and appreciate its "beauty" more. I am now more confident going into my honours year.