Complex Numbers and the Unit *i* With a Focus on Exponential Behavior

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<u>Abstract</u>

The unit *i* can be simply defined as the square root of negative one. Although *i* may have a succinct definition, various high school mathematics courses involve learning about *i* and its properties. In addition, complex numbers (numbers in the form a+bi) play a role in many aspects of modern mathematics. The unit *i* and complex numbers came into the mathematical world after considerable controversy, causing established principles to be questioned in the process. Still, after its arrival on the mathematical scene it became a subject of interest to mathematicians everywhere. Some of the most significant characteristics of the unit *i* and complex numbers are those centered on their exponential behaviors. As I sought to explore the exponential attributes of these units, I unearthed several patterns and methodologies that provided me with insight. Subjects that provided me with this insight included the complex plane, de Moivre's Theorem, the polar form of complex numbers, and others. On the whole, the unit *i* and complex numbers are key components to sundry processes and are central to many common mathematical questions.