

1125-13-277

**Nathan A. BeDell\*** (nabedell@liberty.edu). *Logarithms over a Real Associative Algebra.*

Given a real associative and finite dimensional unital algebra  $\mathcal{A}$ , a natural question to ask is how to generalize the standard theory of differential and integral calculus. In this talk, using such a theory to construct the exponential function over  $\mathcal{A}$ , I outline what can be said about the logarithmic functions in  $\mathcal{A}$ . In particular, I present the finding that for a large class of nilpotent algebras the exponential function is injective, and hence such algebras have a unique logarithm on the image of the exponential. In addition to this, I examine how Freese's work on generalized trigonometric functions may be used to find explicit formulas for logarithms analogous to the result that  $\text{Log}(z) = \log(|z|) + i\text{Arg}(z)$  from complex analysis. To conclude the talk, I discuss some relevant open problems to this line of inquiry, and discuss how the theory of logarithms might be applied to other areas of mathematics. (Received August 22, 2016)