1125-16-290 **James S Cook*** (jcook4@liberty.edu). *$\mathcal{A}$-Calculus on a Real Associative Algebra.*

Let $\mathcal{A}$ denote a real associative unital algebra of dimension n. If $f : \mathcal{A} \to \mathcal{A}$ is Frechet differentiable at p and if differential $d_p f$ is right-$\mathcal{A}$-linear then we say f is $\mathcal{A}$-differentiable at p. If $\mathcal{A}$ is the quaternions then $\mathcal{A}$-differentiability gives us a method to differentiate with respect to a quaternionic variable. We contrast our definition to that which defines the derivative by a limit modulo the zero-divisors in $\mathcal{A}$. We also show how to construct $n-1$ conjugate derivatives for which the $\mathcal{A}$-differentiable functions have trivial conjugate derivatives. Generalized Laplace equations derived by Wagner and later by Waterhouse are reproduced here by a simple computation. Integration over $\mathcal{A}$ is also similar to complex analysis: there is a natural integral over $\mathcal{A}$ which allows the FTC, Goursat's Theorem and even Cauchy's Integral Theorem. However, Cauchy's Integral Formula is not generally available. We describe a joint work with Nathan BeDell where the application of abstract algebraic techniques and integral $\mathcal{A}$-calculus provide solutions of $\mathcal{A}$-ODEs. Zero-divisors produce strange results. (Received August 24, 2016)