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G., Edgar Parker* (parkerge@guilford.edu), Department of Mathematics, Guilford College, Greensboro, NC 27410, **James S. Sochacki** (sochacjs@jmu.edu), Department of Mathematics and Statistics, James Madison University, Harrisonburg, VA 22807, and **Stephen K. Lucas** (lucassk@jmu.edu), Department of Mathematics and Statistics, James Madison University, Harrisonburg, VA 22807. *Analyzing Leah Cosine and Leah Sine through Polynomial Projection.*

Mickens defined the functions Leah Cosine (Lcos) and Leah Sine (Lsin), respectively, as the solutions to $y'' + y^{1/3} = 0, y(0) = 1$ and $y'(0) = 0$, and $y'' + y^{1/3} = 0, y(0) = 1$ and $y'(0) = 0$, making them non-linear analogues to cosine and sine. Mickens and some of his students looked for closed-form solutions and gave qualitative descriptions of the functions. In this talk we study Lcos and Lsin through the lens of polynomial projection, identifying the power series for each function and computing the period. The analysis of Lcos comes directly from the theory of polynomial projection and the analysis of Lsin illustrates issues currently pertinent to the study of the topological boundary of sets of power series which solve ODE's with polynomial generators of fixed degree and on domains of fixed dimension. (Received September 11, 2012)