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Department of
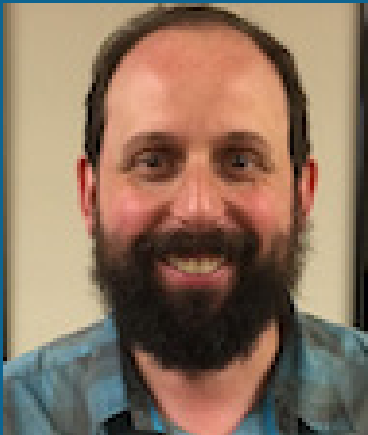Mathematical Sciences

Colloquium
Dr. Mark Colarusso
Associate Professor of Mathematics

University of South Alabama

**Friday,
November 4, 2022
@ 2:00pm**

EMS Building, E495

Dr. Mark Colarusso

**UW-Milwaukee
Department of
Mathematical Sciences**

**EMS Building, Room E403
3200 North Cramer Street
Milwaukee, Wisconsin
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Gelfand-Zeitlin Integrable Systems: Where linear algebra, geometry, and representation theory meet

In the 19th century, physicists were interested in determining the conditions under which the equations of motion for a classical mechanical system could be found by integrating a finite number of times. Such a system was said to be completely integrable. Using symplectic geometry, we can generalize the notion of an integrable system beyond the realm of physics and into Lie theory and representation theory. Such ``abstract" integrable systems can be used to geometrically construct infinite dimensional representations of Lie algebras.

In this talk, I will discuss a family of integrable systems, the Gelfand-Zeitlin systems, that arise from purely linear algebraic data. For an nxn complex matrix X, we consider the eigenvalues of all the ixi submatrices in the top left hand corner of X. These are known as Ritz values and play an important role in numerical linear algebra. We will see how questions about Ritz values naturally lead to the construction of the Gelfand-Zeitlin integrable systems. I will explain results about the geometric properties of these systems and indicate how they answer questions of Parlett and Strang about Ritz values. I will also show how this research provides the foundation for the geometric construction of a category of infinite dimensional representations of certain classical Lie algebras using the theory of quantization.

Refreshments will be served in EMS E495 following this event.

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