

UNDERGRADUATE MATH SEMINAR

The next math seminar will be

DATE: **THURSDAY, February 12, 2026**

Time & **12:30 – Refreshments in Bailey 204**

Location: **12:50 – 1:45 Seminar in Bailey 207**



Professor Rachel Bailey

In this seminar, **Professor Rachel Bailey**, a mathematician at Bentley College whose research interests lie in the intersection of many fields of math, including algebra, analysis, will present the following talk.

Title: Orthogonal Polynomials in Quantum Computing

Abstract: Perfect state transfer is a phenomenon in quantum information theory in which a quantum state placed at one location in a network is transmitted to another location with probability one. Surprisingly, the mathematics underlying this physical process is deeply connected to classical objects from analysis: orthogonal polynomials. In this talk, we will explore how properties of orthogonal polynomials can be used to determine whether perfect state transfer occurs in quantum spin chains. I will introduce the basics of both quantum computing and orthogonal polynomials, so curiosity is the only thing necessary to attend this talk.

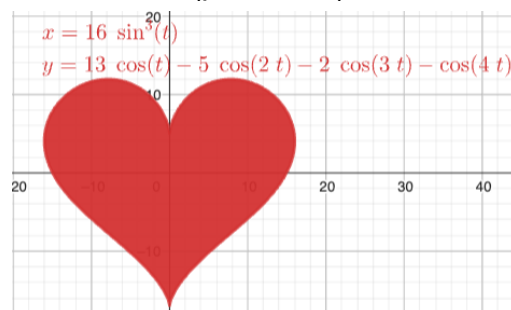
Pieces from Thesis: Vanessa Jorgensen

*Vanessa wrote her senior thesis this past fall under the guidance of **Professor Roger Hoerl**.*

The NCAA Men's Division 1 basketball tournament or "March Madness" has always been famous in its unpredictability. In fact, this tournament is so unpredictable in its nature that no one has ever been able to predict the outcomes past the first round. While first round upsets are no stranger to this tournament there is one that stands out more than any other, the 12 seed team beating the 5 seed team. This happens significantly more than any other upset in the first round, with no real reason being determined. Throughout my thesis I aimed to identify which regular season metrics are most helpful in determining when the 12 seed team upsets the 5 seed.

In my work I used a comprehensive historical regular season NCAA men's basketball data set dating back to 2002. To identify which of these regular season statistics would be most influential, I used logistic regression for predictive modeling. I tested out a variety of different models with different groups of variables and then performed cross validation to ensure the model chosen had predicted the match ups the best, looking specifically at the misclassification rates of all of my models. After ensuring the model was most accurate, I determined three key statistics that play a key role in this upset: active head coaching length for the 12 seed ($p=.0068$), regular season steal rate for the 12 seed ($p=0.0189$), and the regular season turnover percentage for the 5 seed ($p=0.0192$).

These findings validated some long standing basketball ideologies. For example, it seems logical with the chaotic, competitive nature of this tournament, especially in the first round, for the mistakes of a higher ranked 5 seed to increase along with the defensive level of play for the 12 seed. Therefore, when filling out your brackets this March, for each 5-12 seed matchup it is essential to look at these three key statistics to ensure your bracket is not busted by the most predictable upset in college basketball.



Happy Valentine's Day from Geogebra