# Department of Mathematics and Statistics

# Colloquium Series

## From Fibonacci numbers to polynomials, integrals, and vector spaces


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**Abstract:** Many people have heard of the famous sequence of Fibonacci numbers, which starts $0, 1, 1, 2, 3, 5, 8, \ldots$. Each term in the sequence is the sum of the two previous terms. In other words, $F_n = F_{n-1} + F_{n-2}$. We can generalize this idea by adding coefficients to the recurrence to consider sequences which satisfy $X_n = aX_{n-1} + bX_{n-2}$. The collection of all sequences satisfying this recurrence is denoted by $\mathcal{R}(a, b)$. Viewed this way, the Fibonacci sequence is simply one element among many in the space $\mathcal{R}(1, 1)$. It turns out that many of the famous facts about Fibonacci numbers are facts which are true of sequences in $\mathcal{R}(a, b)$. Finally, by letting $a = x$ and $b = 1$, we obtain the Fibonacci polynomials $F_n(x)$. In joint work stemming from the Park City Math Institute in 2017, we investigated a new sequence obtained by integrating $e_n = \int_0^\infty F_n(x)e^{-x}dx$. In this talk, we'll show how one particular Fibonacci fact allows us to investigate the sequence $\{e_n\}$.



**Keywords: Fibonacci, combinatorics, sequences**


Wed. Oct. 6, 1:05 – 1:50 pm on Zoom

For more info visit the department website for the colloquium

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