Some Irreducible Representations of the Braid Group
Irida Altman

In this paper we proved that the number of irreducible representations of the quotient group $B_n/\langle \sigma_k \rangle$ of dimension lesser than $n$ is equal to $k^2$, where $k \in \mathbb{N}$ ($k \neq 1$). As a corollary it follows that for any given $n$, we can obtain $p(n) - 4$ irreducible representations of $B_n$ of dimension greater than $n$ directly from the irreducible representations of the symmetric group $S_n$, where $p(n)$ denotes the number of partitionings of the natural number $n$.

Characteristic Classes and Chern-Weil Theory
Anand Deopurkar

We explore the construction of characteristic classes of vector bundles and principal $G$ bundles by Chern-Weil's method. We focus on the exceptional Lie group $G_2$ and compute its Weyl group $W(G_2)$ and the ring of invariant polynomials on $\mathfrak{g}_2$ under the adjoint action of $G_2$. We also briefly consider the second exceptional Lie group $F_4$ and compute its ring of invariants. We apply the results of this computation to the reduction problem.

Comparing Products of $\mathfrak{sl}_n$ Characters
Galyna Dobrovolska

We prove Lam-Postnikov-Pylyavskyy conjecture for $\mathfrak{sl}_3$ and show that in the case of $\mathfrak{sl}_3$ this conjecture provides necessary and sufficient condition for $\chi_{\nu} \chi_{\rho} \succ \chi \chi_{\lambda} \chi_{\mu}$. We also study support containment version of Lam-Postnikov-Pylyavskyy conjecture for the general case of $\mathfrak{sl}_n$.

Networks, Surfaces, and Representability
Hyun Soo Kim

2-Bottom Schur Functions
Raju Krishnamoorthy

Given $\lambda \vdash n$ of rank $k$, define the $j$-bottom Schur function $\hat{s}_\lambda^j$ to be the sum of terms of degree $k, k + 1, \ldots, k + j - 1$ in the expansion of $s_\lambda$ in terms of power sum symmetric functions $p_\lambda$ where $\deg(p_\lambda) = l(\lambda)$. Stanley and Clifford showed that the set $\{\hat{s}_\lambda^1|\text{rank}(\nu) = l(\nu)\}$ is a basis for the vector space of 1-bottom Schur functions. They conjectured that $\{\hat{s}_\lambda^2|\text{rank}(\nu) + 1 \geq l(\nu)\}$ is a basis for the space of 2-bottom Schur functions. In this paper, we show that this set indeed spans the space of 2-bottom Schur functions. The linear independence of the elements of this set remains open.

Factoring Polynomials
Adriana Lopez
Three Dimensional Rook Theory
KangHao Lu

We generalize the combinatorial rook theory into 3 dimensions. Let \( r_k^T \) be the number of ways of putting \( k \) pairwise nonattacking roots in board \( T \). We analyze rook numbers \( r_k^T \) and rook polynomials \( R(T; x) = \sum r_k^T x^k \) in various boards \( T \). We conjecture that the rook polynomial of any 3-dimensional Ferrers board has only real and nonpositive roots. We prove a special case of this conjecture.

Two Simple Computations Proving the Futaki Invariant
Jason Priestley

Computing De Rham Intersection Cohomology Groups for Psuedomanifolds
Dale Winter

Sarelegi constructed a DeRham intersection cohomology theory for unfoldable psuedomanifolds. In this paper we define a new cohomology for certain special psuedomanifolds, and attempt, with limited success, to show that it is the same as the cohomology defined by Sarelegi.