

Finding Ellipses:
What the numerical range, Poncelet's theorem, and Blaschke products have to do with it
Pamela Gorkin
Bucknell University/National Science Foundation

The numerical range of an $n \times n$ matrix A is defined by

$$W(A) = \{\langle Ax, x \rangle : x \in \mathbb{C}^n, \|x\| = 1\}.$$

We give a brief overview of the numerical range of an operator and discuss situations in which ellipses make a surprising appearance. Generalizing this situation leads us to a class of well-known operators called compressions of the shift operator. Using this point of view, we obtain new insights into the numerical range of these operators. Special things happen when the numerical range is elliptical – at least for low-degree Blaschke products – and this will be made more precise in the talk.