# Quick Proofs with ODEs

## Undergraduate Math Club
## CORNELL UNIVERSITY

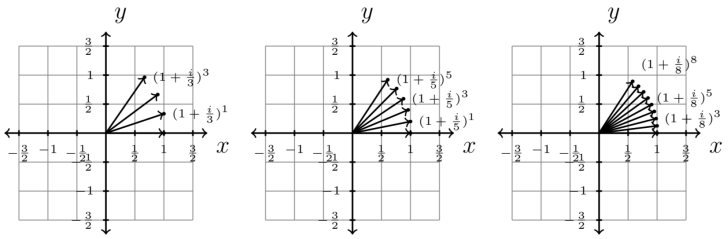


Figure 6: $(1+\frac{i}{n})^n$ for $n = 3, 5, 8$

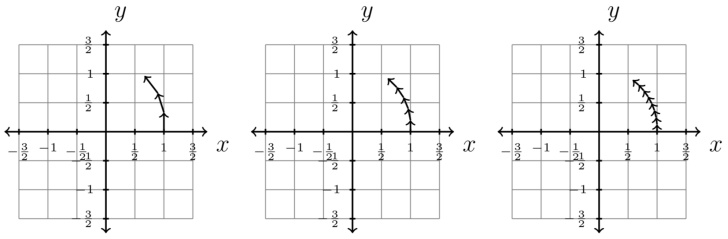


Figure 7: $(1+\frac{i}{n})^n$ for $n = 3, 5, 8$

### SPEAKER

Ely Sandine

### ABSTRACT

In this talk we'll talk about Ordinary Differential Equations. By using the Fundamental Theorem of Calculus as the main uniqueness theorem, we'll re-derive properties of trig and exponential functions including their derivatives, addition formulas, power series expansions, and Euler's identity. We'll then think more about uniqueness and existence. Consider the equations $\frac{dx}{dt} = x^2$ and $\frac{dx}{dt} = \sqrt{|x|}$. The first has solutions that go to infinity in finite time and the second has multiple solutions for a given condition. We'll think about these, along with 2d linear systems. Putting this all together, we'll think about resonance, and explain why forced oscillators get so crazy.

# SEP 23 at 5:15pm

## Malott 532 ⋆ Refreshments