

Colloquium

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A NEW LOOK AT CALCULUS:
HOW AN OLD IDEA NATURALLY LEADS FROM
SIMPLE ALGEBRA TO THE HEART OF ANALYSIS

Friday, October 30, 2015

3:00 p.m. in ES-143

(tea & coffee at 2:30 p.m. in ES-152)

ABSTRACT. We discuss a novel approach to calculus and analysis that builds upon an old idea of René Descartes. We begin with simple algebra to solve the tangent problem for all algebraic curves without using any limits. By adding an elementary estimate one is naturally led to the idea of continuity and, more generally, of limits. In particular, one recognizes that the algebraic derivative can also be captured by a *non-algebraic* approximation process that opens the door to handling transcendental functions such as $E_2(x) = 2^x$. The corresponding generalization of the algebraic derivative leads to the traditional concept of differentiability, in a formulation introduced by Constantin Carathéodory over 60 years ago, and whose advantages should be recognized more widely. We hope that this approach will stimulate discussions about alternatives to the standard introduction to calculus.