

# Fall 2019 Undergraduate Seminar

Department of Mathematics



## The functions they don't tell you about in calculus

### Dr. Everest

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**Date:** Tuesday, November 19

**Time:** 12:00 - 12:50 pm

**Location:** Room 703, Thackeray Hall

Tom Everest got his PhD at Pitt and has been a lecturer here for the last six years. He has been an organizer for the Undergraduate Seminar since 2014 and is ready to help any undergraduate student prepare a talk (HINT HINT). He and his son have won 5 duos matches together in Fortnite. He is currently proving a conjecture that his ability to do algebra is inversely proportional to his proximity to a blackboard.



The functions we use in a calculus class are typically very well behaved. So much so that we get used to not checking hypotheses before applying a theorem. For instance, when using Taylor's Theorem, when was the last time you had to check that a function was  $n$ -times differentiable? We usually work with the likes of  $e^x$ ,  $\cos x$ , and  $\sin x$ , which can be differentiated over and over without ever stopping. In fact, without googling, could you give an example of a function that can *only* be differentiated **twice** at a point?

In this talk we will see examples of functions that can only be differentiated once or twice, or functions that are integrable but not continuous. We will also see an example of a function that is continuous everywhere but differentiable nowhere. What must the graph of such a function look like? Food and drinks will be provided!

Organized by: Derek Orr, Tom Everest, Jeremiah Morgan, and Jeff Wheeler