

RESEQUENCING CALCULUS I AND CALCULUS II

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Shaking things up...

- Changed the order of topics in Calculus I and Calculus II
- Calculus I: Introduce derivatives and integrals simultaneously, include applications but not theory
- Calculus II: Include theory, more complicated integrals, applications, sequences and series

Why?

- Large number of students who have taken (AP) Calculus in high school
- Certain majors (e.g. biology) only require Calculus I
- Desire to promote more critical thinking and less rote memorization

Calculus I Sequence

- Limits (graphically, numerically, algebraically)
 - postpone epsilon-delta proofs to Calc II
- Derivatives (powers, sums, differences, exponential and logarithmic functions)
- Antiderivatives of the above functions
- Product/Quotient Rule
- Integration by Parts

Calculus I Sequence, continued

- Chain Rule
- Integration by Substitution
- Related Rates
- Riemann Sums and Definite Integrals
- Fundamental Theorem of Calculus
- Optimization
- Separable Differential Equations

Calculus II Sequence

- Limits: epsilon-delta proofs
- Derivative proofs: product rule, chain rule, MVT
- Proof of the Fundamental theorem of Calculus
- L'Hospital's Rule
- Volumes, Average value of a function, applications
- Integration of complicated trig functions and by using trig substitution and partial fractions
- Improper integrals, sequences and series

Product Rule & Int. by Parts

- Focus on products of functions (e.g. $x \sin x$)
- $\frac{d}{dx}(fg) = fg' + gf'$
- $(x \sin x)' = x \cos x + \sin x$
- $\int fg' dx = fg - \int gf' dx$
- $\int x \cos x dx = x \sin x - \int \sin x dx$

Successes:

- Refreshingly new to students and professors
- Requires students to determine whether differentiation or integration is used in a problem
-- higher order skill
- Separable differential equations & applications

Successes:

- One semester of calculus = more complete picture of the strength of calculus
- Focus on theory and more complicated techniques in Calculus II
 - introduces proof early, cut down on disconnect between algorithmic math and theoretical math
 - math majors more prepared for 200-level courses

Pitfalls:

- Textbook – first draft of an in-house *Mathematica*-based online textbook being tested this fall
 - bouncing around chapters in Stewart's ET *Calculus*
- Students who have had Calculus I at another college
- Students who have no calculus experience?
(anecdotally this is no disadvantage)

Want more info?

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Questions?