

Proofs of Ten Theorems from First Semester Calculus

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William Rose
Montgomery Blair High School Silver Spring, MD

Plan:

- Some brief comments on the role of proof in the calculus classroom
- Presentation of proofs of some of the basic theorems from differential calculus

Disclaimer:

- There's nothing really new in this talk
- I'm not an expert
- These are just the same theorems that are in every calculus textbook, calculus classroom

Why do we prove theorems in calculus?

- Just because (it's part of the curriculum)
- It helps the students succeed on assessments (AP, etc.)
- To convince the students that the theorem is true
- To understand the theorem
- To provide students with the tools and experience with proof that they may use to verify their own conjectures
- To publicly establish a new fact that the class all agrees on and can be used in the future

So proofs should:

- Be coherent
- Provide understanding
- Be memorable and therefore reproducible by the student

The theorems:

1. The Product Rule
2. The Reciprocal Rule
3. The Quotient Rule
4. Chain Rule (skipping, sorry)
5. Fermat's Theorem
6. Rolle's Theorem (skipping, sorry)
7. Mean Value Theorem (skipping, sorry)
8. A function is constant if its derivative is 0
9. A function is increasing if its derivative is positive
10. If $f'' > 0$, then the tangents to f lie below f

Questions?

William Rose

Montgomery Blair High School

Silver Spring, MD

Mrrose31@gmail.com

@wrose31