

MATH 477 Fractal Analysis: Bolzano's Function S2010

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Office Hours: All Mondays and most Wednesdays 3:40-4:30, Friday 1:30-2:30, by appointment, or drop by.

Grading:

Attendance: 33%
Paper: 34%
Instructor Evaluation of Participation: 33%

Total: 100%

90% = A- or better
80% = B- or better
70% = C- or better
60% = D- or better

Course Description: In this directed study, the student will carry out a research project on the fractal nature of Bolzano's continuous but nowhere differentiable function. The following topics concerning Bolzano's function will be included in the course:

- 1) Researching its history up to what is currently known about its properties.
- 2) Writing up the student's calculation of the statistical fractal dimension of

its graph using LaTeX.

- 3) Calculating the related areas under its graph.
- 4) Approximation of box counting dimension using Excel macros.
- 5) Approximation of statistical fractal dimension using middle 1/2's (as opposed to middle 1/3's): Mathematica.

If time allows, the following topics may be included:

- 1) Extending the student's calculations to the 1-parameter family of continuous but nowhere differentiable functions studied in H. Okamoto's paper "A Remark on continuous, nowhere differentiable functions".

At the end of the semester the student will hand in a paper on his research project written using LaTeX.

Readings will be from:

- Krantz, Steven. "How to Write Your First Paper." Notices of the AMS, December 2007, pp.1507-1511
- Falconer, Ken. Fractal Geometry: Mathematical Foundations and Applications. Wiley, 2003.
- Wilkins, David R. "Getting Started with LaTeX." 1995.
- Other sources found along the way.