Chapter 1 : differentiability of complex function in a domain D - Mathematics Stack Exchange

The spaces of functions with derivatives in Lp, called the Sobolev spaces, play an important role in modern analysis. During the last decades, these spaces have been intensively studied and by now many problems associated with them have been solved.

Students in calculus need to be proficient in working with functions in a variety of ways: This demo provides a set of visualizations designed to help students better understand what it means for a piecewise function to be differentiable at a particular domain value. The visualizations and activities in this demo are appropriate for high school or college level calculus classes. With careful explanation about slopes of graphs of nonlinear functions and sufficient background, the demo may be accessible to precalculus students. Excel files that accompany this demo are freely downloadable and can be used in class or for individual investigations by students. It is often the case that my students try to memorize procedures instead of striving to gain an understanding of fundamental mathematical concepts. The visualizations in this demo were developed with the idea that if a student gains geometric insight, then an analytic approach will become more meaningful. A recent study [1] suggests that in science classes, a discussion prior to executing the demo and a post-discussion where students articulate and write down what they observed can be beneficial to student learning. This demo is concerned with choosing values of parameters so that a piecewise function is differentiable; a separate demo related to continuity of piecewise functions can be found by following this link. Thus, there are TWO conditions to satisfy by choosing values of the parameters k and m. First, the function must be continuous left and right pieces match. Secondly, the pieces must match with the same slope. Left and right hand parts match Graph of the derivatives of the left and right hand parts. Remember that if a function is differentiable at a point, it must be continuous there. Graphs of derivatives of left and right hand parts. A graph of the continuous function and its derivative is shown below. A Quicktime movie that shows changes in parameters k and m is shown below. When using the movie in class, it is useful to pause the playback so that you can discuss the situation when the function is continuous but not differentiable. It is also useful to pause the playback when the derivative pieces "match" but the function pieces do not so that you can point out that the function is not differentiable because it is not continuous. The functionality of the movie control bar is shown below. Click the PLAY button to initiate the movie. A Java implementation of this example is given below. Note that the functionality of the applet does not provide the ability to plot individual points, so behavior at the break point and endpoints should be discussed. The graph of the function is in magenta; the graph of the derivative is in green. The object is to use the sliders to choose parameters for which the magenta pieces match and the green pieces match. This is shown in the next figure. This somewhat uninteresting situation is illustrated below. In this case, the continuity condition implies that This situation is illustrated by the figure below: Thus, a and b can have any equal value. In this case, a and b are equal in absolute value but are negatives of each other. This situation is illustrated below. A variety of examples have been constructed that can be used for classroom demonstration as well as for individual student exploration. An Excel file with 10 interactive example can be downloaded from here. In order to use the control features in the file, you must choose "Enable Macros. That applet can be accessed by clicking on this link. Paul, and Mazur, Eric. Learning tools or entertainment? Physics, 72 6 , June , pp Math at Mathforum Drexel. Excel files were developed by David R. Hill at Temple University and Lila F. Roberts at Clayton State University.

Chapter 2 : Differentiability of Piecewise Functions

Vladimir G Maz'ya and Sergei V Poborchi () EXTENSION OF FUNCTIONS TO THE EXTERIOR OF A DOMAIN WITH THE VERTEX OF A PEAK ON THE BOUNDARY. Differentiable Functions on Bad Domains: pp.

Chapter 3 : calculus - How to prove that a function is differentiable everywhere? - Mathematics Stack Exch

Part 3 Sobolev spaces for domains with cusps: extension of functions to the exterior of a domain with the vertex of a peak on the boundary; imbedding theorems for Sobolev spaces in domains with cusps; traces of functions in Sobolev spaces on the boundary of a domain with a cusp.

Chapter 4 : Sobolev space - Wikipedia

The spaces of functions with derivatives in L p, called the Sobolev spaces, play an important role in modern analysis. During the last decades, these spaces have been intensively studied and by now many problems associated with them have been solved.

Chapter 5 : Differentiability at a point: algebraic (function is differentiable) (video) | Khan Academy

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But a function can be continuous but not differentiable. For example the absolute value function is actually continuous (though not differentiable) at x=0. For example the absolute value function is actually continuous (though not differentiable) at x=0.