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**Proofs and Ideas**
* A Prelude to Advanced Mathematics
By B. Sethuraman

The transition to proof course in the undergraduate curriculum is perhaps the least well-defined course in the curriculum. We, the professoriate, all more or less agree on what belongs in linear algebra or real analysis. There is no corresponding consensus on the right way to teach undergraduates how to read, write, and create proofs. As a result, there are a wide variety of texts taking disparate approaches. Sethuraman’s approach in *Proofs and Ideas* is to emphasize mathematical ideas. He believes that an appreciation for proof is best learned in a mathematical context that possesses independent intellectual appeal. Sethuraman eschews dry formality and discussions of metamathematical, logical principles. Instead he favors careful investigation of concepts that students will revisit later in their mathematical studies. It is an approach that will appeal to any teacher who prefers thinking about mathematics over thinking about logical principles. In a sense, this is a throwback to the way we did things decades ago, students learn proof appreciation in the context of learning some interesting mathematics. The difference is that Sethuraman is careful to make clear how the reasoning process in mathematics works and why we value it—i.e., because it leads to understanding of these beautiful mathematical ideas.

The author is a gifted expositor and a congenial guide, undergraduates will have no trouble reading and understanding this book. There are hundreds of exercises at a variety of levels of difficulty. The book contains the usual core topics of the transitions course from set theory (including cardinality) and discrete mathematics, it concludes with independent chapters in number theory, real analysis, topology, algebra, and graph theory from which instructors can pick and choose to assemble a coherent course.

**An Introduction to Proof via Inquiry-Based Learning**
By Dana C. Ernst

Dana Ernst is one of the leaders of the nationwide movement for teaching with inquiry-based learning (IBL). In a passage in the preface describing his evolution from lecturer to IBL teacher he quotes Dylan Restek, "Things my students claim that I taught them masterfully, they did not know." This book is part of his work to fix that problem.

One of the research-identified crucial components of IBL is that students engage deeply with coherent and meaningful mathematical tasks. This requires that the instructor prepare a sequence of tasks that are developmentally, and mathematically, appropriate. That is exactly what Ernst’s book provides. It evolved from course notes the author developed over a decade ago. Those notes were shared under a Creative Commons license and were used and modified by dozens of instructors at a variety of institutions. Anyone who has ever taught an IBL course from scratch knows that the second biggest challenge is having a well-designed sequence of challenges. The path to theorems has to be dissected into steps that students can take on their own. Ernst’s sequence has been refined by him and others over the years. As an example, the proof of the fundamental theorem of arithmetic is accomplished in a sequence of thirteen problems: some are computational, some require creation of an example or counterexample, some require one or two insights that should naturally occur to students as a result of the prompting implicit in the preceding problems.

By the way, the biggest challenge of IBL teaching is convincing students to trust that you know what you’re doing and that they will learn if they play along. As Ernst says to student readers in his preface, “If you are doing things well, you should be confused most of the time.”