

## 18. The Transition to Formal Thinking

Quote

### INTRODUCTION

The transition to formal thinking is normally introduced in the first or second year of a university mathematics course. To reach such a level, the student has studied arithmetic, algebra and calculus, together with a range of mathematical topics, and so is able to calculate with numbers, manipulate algebraic symbols to solve equations, represent them graphically, and perform the usual routines of the calculus, usually with considerable success. Now she or he is introduced to the ideas of defining mathematical concepts with precise concept definitions and deducing properties from these formal definitions by logical deduction. However, the student is now in a dilemma. He or she has a great deal of knowledge of mathematics from school and is asked to start over again with formal definitions of concepts that are often already familiar. Stewart, for example, when presented with the definition of the real numbers in terms of the arithmetic of numbers, their order properties, and the special ‘completeness’ property that asserts that ‘any increasing sequence of numbers that is bounded above has a limit value that it gets arbitrarily close to’ was completely bemused: