

**18.S67: LOGIC AND COMPUTATION (SPRING 2008)**  
**FRESHMAN SEMINAR**

**Meeting:** Thursday 2:30 - 4:30

**Instructor:** Eric Rosen

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**Description:** Mathematics involves both proof and computation. For example, we may be interested in proving that certain polynomials have roots and also in finding a way to calculate them. The purpose of this seminar will be to investigate these notions in depth, revealing interesting connections between mathematics, logic, and computer science. We will begin by introducing several formal models of computability which provide the framework for analyzing the theoretical limits of an idealized computer. This makes it possible to show that certain natural problems are, in principle, unsolvable. (One such: determine whether a polynomial equation has a solution in the integers.)

We will then turn to the relationship between proof and computation, considering the following two questions. Can a computer be programmed to carry out any mathematical proof? Could a computer determine whether any (suitably formalized) statement about the integers is true or false? The answers, due to Kurt Gödel in the 1930's, are milestones in the development of mathematical logic.

**Format:** The seminar will meet once a week for two hours, and will consist of a mixture of lecture and discussion. Active student involvement will be encouraged, even required. Class size will be limited to 8, with priority being given to freshmen.

**Requirements:** Regular homework assignments and class participation.

**Text:** *Computability and Logic*, by Boolos, Burgess, and Jeffrey (Cambridge University Press 2007)