Gödel's Work on Undecidability

A Sample Proposal for Honors-Enhancement of

Math Reasoning (MATH 2800-088)

Robert Gardner, Fall 2008

Abstract. I will explore the work of Kurt Gödel on the undecidability of certain axiomatic systems. I will discuss various historical background to Gödel's work, including formalism and Platonism. As part of this background, I will mention the work of Russell and Whitehead (*Principia Mathematica*) and the related work of Gottlob Frege. I will mention the use of "models" to illustrate axiomatic systems and consistency. I will describe Gödel numbers and Gödel's proof that any axiomatic system which includes elementary arithmetic (with multiplication) is not a complete axiomatic system (relying for this material on reference [4] below). Philosophical implications of this work will be briefly mentioned. I will write up my findings in a 5–7 page paper (or 2000 to 2500 words) and prepare a PowerPoint presentation based on the paper to be given either in a Math Department Seminar, in the Math Reasoning class, or at the end of the semester SAMHIDD seminar.

Literature Review

1. Gödel, K. *On Formally Undecidable Propositions of Principia Mathematica and Related Systems*," NY: Dover Publication, 1992.

2. Goldstein, R. *Incompleteness—The Proof and Paradox of Kurt Gödel*, NY: W.W. Norton, 2005.

3. Hofstadter, *Gödel, Escher, and Bach*, NY: Basic Books, 1979.

4. Nagel, E. and Newman, J., *Gödel's Proof* (revised edition), NY: New York University Press, 2001.

RBG-May-2008