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1002-35-207   **Lan Cheng*** (`lac26@pitt.edu`), Department of Mathematics, University of Pittsburgh, Pittsburgh, PA 15260, **Xinfu Chen** (`xinfu@pitt.edu`), Department of Mathematics, University of Pittsburgh, Pittsburgh, PA 15260, **John Chadam** (`chadam@imap.pitt.edu`), Department of Mathematics, University of Pittsburgh, Pittsburgh, PA 15260, and **David Saunders** (`saunders@math.pitt.edu`), Department of Mathematics, University of Pittsburgh, Pittsburgh, PA 15260. *Inverse of First-Crossing Boundary Problem.*

This paper studies the inverse of the first passage time problem for a diffusion process. We first show that this problem can be associated with a free boundary problem for a parabolic partial differential operator. We prove that there exists a unique viscosity solution of the free boundary problem. We also study the asymptotic behavior of the boundary for small times. Finally, we derive an integral equation for the first passage boundary. Based on both the initial asymptotic behavior and the integral equation, we compute the boundary and compare the results from our algorithm with three other numerical methods. (Received September 14, 2004)