Supremum Distribution of Bessel Process of Drifting Brownian Motion

Andrzej Pyć
Grzegorz Serafin
Tomasz Żak

Abstract: Let us assume that \((B_t^{(1)}, B_t^{(2)}, B_t^{(3)} + \mu t)\) is a three-dimensional Brownian motion with drift \(\mu\), starting at the origin. Then \(X_t = \|(B_t^{(1)}, B_t^{(2)}, B_t^{(3)} + \mu t)\|\), its distance from the starting point, is a diffusion with many applications. We investigate the supremum of \((X_t)\), give an infinite-series formula for its distribution function and an exact estimate of the density of this distribution in terms of elementary functions.

2000 AMS Mathematics Subject Classification: Primary: 60J60; Secondary: 60G70.

Keywords and phrases: Drifting Brownian motion, Bessel process, supremum distribution, estimates of theta function.

The full text is available here