

Universidade Estadual de Campinas

Workshop in Stochastic Analysis and Applications

- August, 2018 -

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On the winding number of planar Brownian motion

Abstract

We consider a Brownian motion $\{B(t) : t \geq 0\}$ in \mathbb{R}^2 (identified with \mathbb{C}), starting at $z_0 \neq 0$. Let us denote by $R(t)$ its radial part, and by $\Theta(t) \in (-\infty, +\infty)$ its continuous argument. A formula for the density of $(\Theta(t) | R(0) = \rho)$ is obtained by standard methods, and several consequences are derived. In particular, the asymptotic behaviour of the argument both as $t \rightarrow \infty$ and as $t \rightarrow 0$ follow, as well as an expression for the density of the Brownian motion on a wedge of any angle.