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ON LIMIT THEOREMS FOR THE FIRST EXIT TIME FROM A STRIP FOR STOCHASTIC PROCESSES. I

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We consider a stochastic process $\xi(t)$, $t \geq 0$, $\xi(0) = 0$, with independent stationary increments. Let $T = T(a,b) = \inf\{t > 0 : \xi(t) \notin [-a,b)\}$, $a > 0$, $b > 0$. Under some restrictions on $\xi(1)$, we obtain asymptotic expansions as $a+b \to \infty$ for the Laplace–Stieltjes transforms of the suitably normed random variable T with a fixed direction of exit. The cases $\mathbb{E}\,\xi(1) = 0$ and $\mathbb{E}\,\xi(1) < 0$ are considered and the situations $a \to \infty$ and $a = \text{const}$ are separately treated. We also show how to pass from the obtained results to asymptotic expansions for probabilities.

Key words and phrases: first exit time, boundary crossing problems for stochastic processes, asymptotic expansion, infinitely divisible factorization.

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