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Semiflexible chain statistics with fixed end orientations ANDREW SPAKOWITZ, UC Berkeley, LEI ZHANG, NILES PIERCE, ZHEN-GANG WANG, Caltech — The simplest model of a semiflexible polymer is the wormlike chain model, which describes the chain as a deformable thread whose bending energy is quadratic in the chain curvature. Using the wormlike chain model to predict polymer behavior in a number of scenarios requires the end-to-end distribution function, which gives the statistics for the position of the end of the chain. We find exact expressions for this fundamental solution incorporating the end positions and the tangent orientations of the end points. Our results for the end-to-end distribution function in Fourier-Laplace space adopt the form of infinite continued fractions, which emerge upon noting the hierarchical structure of the moment-based expansion. We use these results to view the end-to-end distribution function for a wormlike chain in two dimensions with one end pointed in a fixed direction and the other end free. As we progress from high to low rigidity, the end-to-end distribution function shifts from being peaked at a location pointed along the end tangent vector, implying a straightened chain, to the peak being located at zero end separation, as in the Gaussian limit. The crossover between these limiting behaviors exhibits a double-peaked end-to-end distribution function. We discuss our results in the context of looping of a semiflexible polymer, which is relevant in a number of DNA-related phenomena.

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