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Inflation Correlators at Tree and Loop Levels

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During cosmic inflation, massive particles can be spontaneously produced due to quantum fluctuations, leaving imprints in the correlator of (nearly) massless inflaton fluctuations. Information about physics at the inflation scale is then encoded in such inflation correlators and is hopefully recovered by future cosmic observations. However, our understanding of inflation correlators is very limited compared to their Minkowskian counterparts, namely the scattering amplitudes in flat spacetime. In recent years, several methods are developed for the analytic calculations of inflation correlators, including the partial Mellin-Barnes representation and a modified version of cosmological bootstrap. For tree-level processes, full results of 4pt correlators are derived. We also obtain new closed-form results for 3pt and 2pt correlators via bootstrap equations. At the loop level, we derived a factorization theorem and a cutting rule using the partial Mellin-Barnes representation. With the factorization theorem, we calculate the nonlocal signals (nonanalytic parts) of typical 1-loop processes.

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