The SL(2, C) Casson invariant for knots and the $\hat{A}$-polynomial
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Abstract. In this paper, we extend the definition of the $SL(2, \mathbb{C})$ Casson invariant to arbitrary knots $K$ in integral homology 3-spheres and relate it to the $m$-degree of the $\hat{A}$-polynomial of $K$. We prove a product formula for the $\hat{A}$-polynomial of the connected sum $K_1#K_2$ of two knots in $S^3$ and deduce additivity of $SL(2, \mathbb{C})$ Casson knot invariant under connected sum for a large class of knots in $S^3$. We also present an example of a nontrivial knot $K$ in $S^3$ with trivial $\hat{A}$-polynomial and trivial $SL(2, \mathbb{C})$ Casson knot invariant, showing that neither of these invariants detect the unknot.