The Barth quintic surface has Picard number 41

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Dedicated to Wolf Barth

Abstract. This paper investigates a specific smooth quintic surface suggested by Barth for it contains the current record of 75 lines over the complex numbers. Our main incentive is to prove that the complex quintic has Picard number 41, and to compute the Néron-Severi group up to a 2-power index. We also compute Picard numbers for reductions to positive characteristic and verify the Tate conjecture.