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4. Algebraic Geometry

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Klein's surface of genus three and associated theta constants

Klein's surface of genus three is the closed Riemann surface R defined by $y^7 = x(x-1)^2$. This surface is famous because the automorphism group $Aut(R)$ has order 168, the maximum possible. We represent R as a 7-sheets covering surface over $\mathbf{P}^1$ and calculate the period matrix. The aim of our work is to decide the proportionalities of associated theta constants of R. First we show that 36 theta constants are distinguished in 6 orbits by the action of rhe representation of an automorphism of order 7. Next, using the theta identities, we determine the proportionalities of theta constants explicitely. The proportionalities mean the homogeneous coordinate of the projective image of the Jacobian variety associated to R by means of theta constants.