PROJECTS FOR STUDENTS

IAN MARSHALL

I   Continued fractions: Liouville's Theorem and the existence of transcendental numbers; Pell's equation; Hurwitz Theorem; Markov numbers. See first of all Courant and Robbins "What is Mathematics?", then also Rosen "Elementary Number Theory", or some appropriate Russian-language alternative.

II   The Schwarzian derivative – as (i) a differential invariant, (ii) the infinitesimal cross-ratio, (iii) a cocycle for transformations of a differential operator under changes of the dependent variable. Curves in projective space, the Virasoro algebra, Poisson structure, differential invariants are all possible themes to develop. The basic reference is expected to be Ovsienko and Tabachnikov.

III   Poisson Lie groups. Basic definitions involve learning about Poisson structure and Poisson actions. Learn about the r-matrix, the Drinfeld/Heisenberg double, Lie bi-algebras; learn about Poisson reduction and look at some examples. The main reference is expected to be the book "Integrable Systems" by Reyman and Semenov-Tian-Shansky.

— all the references mentioned above are available in Russian