Exact solutions of the two-dimensional fin problem with temperature dependent thermal conductivity and heat transfer coefficient

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This study investigates solutions of two-dimensional nonlinear fin problem with both thermal conductivity and heat transfer coefficient being given as power laws of temperature. The nonlinear problem considered here is linearized by a point transformation when the exponents of the power laws for heat transfer coefficient and thermal conductivity are equal. One dimensional optimal system of subalgebras is constructed for the point symmetries admitted by the governing equation with different exponents of the power laws and reductions are performed. Exact solutions satisfying the realistic boundary conditions are constructed. The effect of the physical parameters such as aspect ratio, thermo-geometric fin parameter, heat flux and fin efficiency are analyzed.