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Programs & Abstracts

BIBLIOGRAPHY

[1] Junker, G., *Supersymmetric Methods in Quantum and Statistical Physics*, Springer–Verlag Berlin Hei New York (1996).
[2] Cooper, F., Khare, A., Sukhatme, U., *Supersymmetry in Quantum Mechanics*, World Scientific, Si (2001).
[3] Rajchel, K., *The Shape Invariance Condition*, Concepts of Physics, vol. III, **1**, 25–33 (2006).

New solvable potentials with bound state spectrum

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Abstract A new family of solvable potentials related to the Schroedinger–Riccati equation [1- been investigated. This one–dimensional potential family depends on parameters and is restricted real interval. It is shown that this potential class (which is a rather general class of solvable pot related to the hypergeometric functions) can be generalized to even wider classes of solvable pote As a consequence nonlinear Schroedinger type equation has been obtained.

BIBLIOGRAPHY

[1] Junker, G., *Supersymmetric Methods in Quantum and Statistical Physics*, Springer–Verlag Berlin Heid New York (1996).
[2] Cooper, F., Khare, A., Sukhatme, U., *Supersymmetry in Quantum Mechanics*, World Scientific, Sin (2001).
[3] Rajchel, K., *The Shape Invariance Condition*, Concepts of Physics, vol. III, **1**, 25–33 (2006).

Identification of the nonlinear differential system for the bacteria popula under antibiotics influence

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Abstract A bacteria populution under antibiotics influence is consedered. The antibiotic can be tericidal and bacteriostatic. The bactericidal antibiotic kills bacteria, and bacteriostatic one supp their fertility. A part of the bacterias is resistent to the antibiotic. The sensible bacterias are vi than resistent bacterias if the antibiotic is absent. The system is described by the nonlinear differ equations

$$\dot{x}_s = \Big[\frac{a_s}{1 + c_{as}(t)k_{as}x_s\big(x_s^{\theta_{as}} - 1\big)} - b_s(x_s + x_r) - c_{ac}(t)k_{ac}\big(x_s^{\theta_{as}} - 1\big)\Big]x_s + a_{rs}x_r,$$

$$\dot{x}_r = \Big[a_r - b_r(x_s + x_r)\Big]x_s + \frac{a_{sr}x_s}{1 + c_{as}(t)k_{as}x_s\big(x_s^{\theta_{as}} - 1\big)},$$

where x_s and x_r are the populations of the sensible bacterias and resistent bacterias, a_s and a_r a growth, b_s and b_r are its sensitivity to the boundedness of the environment, a_{sr} and a_{rs} are the cro

s between sensible bacteria and resistent bacteria by mutations or plasmids with sensitivity e antibiotic, c_{ac} and c_{as} are the concentrations of the abactericidal and bacteriostatic ntibiotics, constants on the treatment interval $[t_1, t_2]$ and equal to zero outside this interval. The positive rs k_{ac}, k_{as}, θ_{as}, and θ_{ac} are determined by the concrete antibiotic class.
rect mathematical and numerical analysis of this system is realized with following results. The opulation increases to the start of treatment with a significant predominance of the most viable bacteria. Then their population drops dramatically under the influence of antibiotic. However lation of the resistent bacteria increases. So the antibiotic gets practically ineffective. The bacteria population is restored after discontinuation of treatment.
parameters of the system are unknown in really. The inverse problems for the considered system l with using of the experimental data from Scientific Center for Anti–infectious Drugs of Almaty.

y problem for some nonlinear system of n order ordinary differential ons

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t In this work the general solution of some linear system of n–order ordinary differential equations and Cauchy problem for this system is solved.
> 0 and $n \geq 1$ is natural number. We consider the system

$$\frac{d^n u}{dt^n} = f(t)u - g(t)v + h(t, u, v),$$

$$\frac{d^n v}{dt^n} = g(t)u + f(t)v + q(t, u, v)$$

nterval $[0, t_1]$ where $f(t)$, $g(t) \in C[0, t_1]$ and the functions $h(t, u, v)$, $q(t, u, v)$ are continuous et of variables in the domain $G = \{(t, u, v) : 0 < t < \delta, \ |u - \alpha| < \sigma_1, |v - \beta| < \sigma_2\}$. Here α, $v(0) = \beta$; δ, α, β, σ_1, σ_2 are real numbers so that $\sigma_1 > 0$, $\sigma_2 > 0, 0 < \delta < t_1$.
rticular case $n = 1$ the general solution of system (10) and the solution of Cauchy problem for it in [1]. In this work we are solving Cauchy problem for the system (10). Solutions of system (10) ht in the class $C^n[0, t_1]$.
s consider the Cauchy problem for system (10).
chy problem. Find the solution of system (10) from the class $C^n[0, t_1]$ satisfying the conditions

$$u(0) = \alpha_1, \ v(0) = \beta_1, \ u'(0) = \alpha_2, \ v'(0) = \beta_2, ..., u^{(n-1)}(0) = \alpha_n, v^{(n-1)}(0) = \beta_n,$$

α_k, β_k, $(k = 1, 2, ..., n)$ are given real numbers, $u^{(n)}(t) = \frac{d^n u}{dt^n}$.

Bibliography

ngatarov A. *Cauchy Problem for a First Order Ordinary Differential System with Variable Coefficients.* rrent Trends in Analysis and its Applications. Proceedings of the 9th ISAAC Congress, Krakow, 2013. 109-115.

e of Riemann problems for single–periodic poly–analytic functions

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