DIFFERENTIAL EQUATIONS AND NUMERICAL METHODS

Questions – Oral Exam. Spring 2014

2. Lipschitz condition. Gronwall lemma. Proof of uniqueness, continuous dependence on initial conditions.
3. First order separable ODEs. Phase portraits of one dimensional autonomous systems.
4. Systems of linear ordinary differential equations. General case. The maximal interval of solutions coincides with the domain of definition with respect to t of the right hand side (proof by Gronwall lemma).
6. First order linear ODE. Maximal interval, formula, structure of general solution.
7. Linear systems with constant coefficients. General solution (by 2 methods: (i) exponential matrix function, eigenvalues, eigenvectors).
8. Phase portraits in case of 2 dimensional linear systems with constant coefficients.
10. Linear second order equations with constant coefficients.
13. Differentiable dependence on initial conditions, parameters. Linearization. Variational system.
14. 2-dimensional autonomous systems. Phase space analysis near equilibrium points (linearization, Poincaré theory).
15. Typical 1-codimensional bifurcations. Saddle-node bifurcation.
22. Fourier method for heat transfer equation.
24. Application (differential dependence on initial conditions). Space ship model
25. *.

Peter Moson

1 Code of the subject: BMETE90MX46, Contact hours: 4 lectures + 2 tutorials + 0 lab / week, Credit: 8, Evaluation: exam,