List of of Important Topics
math 411 Winter 2009

1. Recall definition of a function satisfying Lipschitz condition and verify such condition for a given function
2. Recall the formulation of the existence and uniqueness theorem for initial value problems.
3. Know how to apply the existence and uniqueness theorem for initial value problems to a given problem.
4. Recall and use Euler Method.
5. Know how to use error bound of Euler's method.
6. Recall definition of local truncation error of FDM for first order ODE's.
7. Know how to obtain the local truncation error of Euler's method.
8. Know derivation of higher order Taylor methods of order n.
9. Recall and use higher order Taylor methods of order n.
10. Know how to obtain the local truncation error of Taylor methods.
11. Understand Runge-Kutta methods as a an approach to achieve same order as Taylor methods with the same order of local truncation error.
12. Know derivation of Runge-Kutta methods of order 2.
13. Know how to use standard second order Runge-Kutta methods: midpoint, modified Euler, Heun's method, and classical 4th order Runge-Kutta method.
14. Understand how a higher order method can be used to approximate the local truncation error of a lower order method. Know how to implement Runge-Kutta-Fehlberg method to control the local truncation error.
15. Know the derivation of multistep methods using Newton's interpolating polynomials.
16. Know the derivation of the local truncation error of a multistep method using Newton's interpolating polynomials.
17. Know how to use Adams predictor-corrector methods.

18. Know how to implement Adams predictor-corrector methods with error control and variable step size.

19. Understand the advantages and disadvantages of predictor-corrector methods compared with Runge-Kutta methods.

20. Understand the difficulty involved in using only implicit multistep methods.