Math 269A: Assignment 5

Assigned Wednesday Nov 7, due Wednesday November 14

Theory

[1] Show that the following DIRK scheme

γ	γ	
1	1- γ	γ
	1- γ	γ

with $\gamma = (2-\sqrt{2})/2$ is second order accurate and has stiff decay.

Computation

[2] Implement the DIRK scheme above for the stiff nonlinear equation

$$y' = -50(y^2 - \sin^2 t) + \cos t$$

using Newton's method to solve the resulting nonlinear equations (note that in this case, you could also use the quadratic formula). Do this for initial data y(0) = 0, for which the solution is y = sin t, and for y(0)=0.5. Also use the time interval [0,π] and time step h =0.1 and 0.001. Plot the resulting solutions.

What You Should Turn In

- Answers to the theoretical problems.
- A printout of the code and the graphs for the computational problems.