Homework # 6, due Mon, Mar 7th.

For all MATLAB problems, turn in your code (and MATLAB diaries when needed).

1. A skydiver jumps from a plane, and up to the moment he opens the parachute the air resistance is proportional to $v^{3/2}$ where v is his velocity. Assume that the time interval is $[0, 6]$ and that the differential equation for his movement downward is

$$v' = 32 - 0.032v^{3/2}, \qquad v(0) = 0.$$

Use Euler's method with $h = 0.05$ to estimate $v(6)$.

2. Create a MATLAB function that solves a differential equation using Heun's method. Run it for the initial value problem

$$y' = t^2 - y, \quad y(0) = 1, \qquad \text{exact solution:} \quad y(t) = -e^{-t} + t^2 - 2t + 2.$$

Do 20 steps with step size $h = 0.1$ as well as 40 steps with step size $h = 0.05$. Does the final global error behave as expected when h is halved? Plot the two approximations and the exact solution on the same coordinate system.

3. Same as in Problem #2 using Taylor's method of order 4.