Homework 2

Due Janaurary 18th

Section 2.1: Problems 1, 5, 9, 13, 18

Section 6.1: Problems 3, 6 (exact solution is $y(t) = -e^t + 1 + 1$),
13 (exact solution is $y(t) = -\frac{1}{2}\sin t - \frac{1}{2}\cos t + \frac{3}{2}e^t$)

Section 6.2: Problems 6 (exact solution is $y(t) = \frac{1}{1+t^2}$),

For your homework you may use Matlab and m-files eul.m, rk2.m, rk4.m, sample_eul, sample_rk2, sample_rk4, and yprime.m. Please find them on my website, **http://desitter.space**

For the problems from Chapter 6, modify the file yprime.m that contains the right hand side of the normal form of the ODE to be solved (you can comment the old line for w by placing the symbol % at the beginning and add a new line). Also you have to change the formula for y_exact in sample_eul.m, sample_rk2.m, sample_rk4.m files. Since both t and y_exact are vectors (arrays) you have to use vector operations in Matlab with a dot before some of the operations.

To get a description of a file sample_eul.m type **help sample_eul** in the Command Window of Matlab. Do the same for the other files.

In Matlab Preferences in the tab Command Window you may want to choose Numeric Format: Long, to see more decimal places of your results

For the problem involving computing error with Eulers method, find y_exact and y_numeric by typing [y_numeric,y_exact] = sample_eul(tspan,y0,h); in the Matlab Command Window with specific values of tspan as an interval [t0, tfinal], the initial value y0, and the step size h.

To generate tables you need to get data for the last elements in arrays y_exact and y_numeric. For that type y_exact(length(y_exact)) or y_numeric(length(y_numeric)) in the Matlab Command Window. Repeat for each step size h of interest. Replace sample_eul by sample_rk2 or sample_rk4 for the Runge-Kutta problems.