CogSci 190 Assignment #1. Due Wed Sept.29th at 11.59 PM.

Upload your solution using bcourses in the assignment tab. Submit a **working ipynb** file and a pdf file if you so wish.

Use the file Runge-Kutta.ipnyb file to answer the following questions.

1) 30 points. Estimate and plot the error in the (0,5) interval for the expressions f(x,t)=x, and f(x,t)=cos(t), for the solution of the differential equations dx/dt=f(x,t). Calculate and plot the error using the analytical solutions. Compare the error incurred using the Euler step and the rk2 procedure described in the ipnyb file provided.

2) 30 points. Estimate the errors in problem 1) using an approximation of the error from the Taylor's formula and compare and plot the errors in 1) with your estimates using Taylor's theorem.

3) 40 points. Solve the equations for Na activation and inactivation for a voltage clamp experiment, where the voltage is stepped from -70 to -40, 0 and 30 mV. Use the approximations and compare the solutions to the analytical solutions given in the lecture and in the Ermentrout handout.
Plot the activation, inactivation and time constants as functions of intracellular voltage.