

# Math 128A, Fall 2016.

## Programming assignment 2, due Dec 4th.

1. Consider a combustion-type equation:

$$\frac{dy}{dt} = ay^2(1 - y).$$

Develop a MATLAB function `Euler.m` to solve this equation using the Euler method of the form

```
function [ylast] = Euler(t0,y0,tlast,N,a)
%      t0: initial value of t
%      y0: initial value of y
%      tlast: final value of t
%      ylast: final value of y
%      N: number of steps in Euler scheme
%      a: parameter of the problem
```

Your program may not use any of the MATLAB built-in functions for solving ODEs.

2. Develop a MATLAB function `RungeKutta.m` that solves the same equation using the Runge-Kutta 4 method; the function should be of the form

```
function [ylast] = RungeKutta(t0,y0,tlast,N,a)
%      t0, y0, tlast, ylast, N,a: same as above
```

Your program may not use any of the MATLAB built-in functions for solving ODEs.

3. Solve the same equation with  $t_0 = 0$ ,  $y_0 = 0.6$ ,  $a = 1$  “by hand” exactly. Plot its exact solution on the interval  $[0, 2000]$  against its solutions found by `Euler.m` and `RungeKutta.m` on the same interval for  $N = 10$ ,  $N = 100$ ,  $N = 1000$ ,  $N = 10000$ .