MTH 301E : Numerical Methods in CE (Fall 2015)

Assignment 2

Due date: 22/12/2015, 22:00

An *e-report* (pdf file) will be prepared individually. **Hand written or scanned documents will not be accepted!**

Please submit your homework through the Ninova web site. Please zip and upload all your files using filename studentID-HW2.zip. You must provide all matlab/octave scripts/functions you wrote with your zipped file.

1 Spline functions

In the table below we report the values of the sea water density ρ (in Kg/m^3) corresponding to different values of the temperature T (in degrees Celsius):

T	4°	8°	12°	16°	20°
ρ	1000.7794	1000.6427	1000.2805	999.7165	998.9700

Compute and plot using Matlab/Octave the associated **quadratic interpolating spline** on 4 subintervals of the temperature interval [4, 20]. Then compare the results provided by the spline interpolant with the following ones (which correspond to further values of T):

T	6°	10°	14°	18°
ρ	1000.74088	1000.4882	1000.0224	999.3650

2 Regression Analysis (20 pts)

The following data are related to the life expectation of citizens of two European regions:

	1975	1980	1985	1990
Western Europe	72.8	74.2	75.2	76.4
Eastern Europe	70.2	70.2	70.3	71.2

- Use the interpolating polynomial of degree 3 to estimate the life expectation in 1970, 1983 and 1988 using Matlab/Octave.
- Plot the regression function
- Calculate goodness of fit $\Re^2$ and MAE, RMSE, MAPE using Matlab/Octave (for details: http://en.wikipedia.org/wiki/Forecasting)

- Extrapolate a value for the year 1995. It is known that the life expectation in 1970 was 71.8 years for the citizens of the West Europe, and 69.6 for those of the East Europe. Recalling these data, is it possible to estimate the accuracy of life expectation predicted in the 1995?

3 Integration (30 pts)

Evaluate the given integral by using Trapezoidal rule and Simpson's $1/3^{rd}$ rule for $h = 1$ and $h = 0.5$ using Matlab/Octave (h represents the size of each interval.)

$$\int_0^4 \frac{dx}{1+x^2}$$

Compare the results with the actual value and calculate the error for Trapezoidal and Simpson's rule of both h values.