

# Numerical Methods - Assignment 8

Due Thursday, Oct 3

1 - Implement a Matlab function

$$[ Q , R ] = \text{qrfact}( A , n , p )$$

which receives a matrix  $A$  of size  $n \times p$  with rank  $p$ , and returns the two matrices of its QR factorisation. You are not allowed to use Matlab's tools for vectorial computation. Instead, you must use the algorithm described in class, or a similar algorithm.

2 - Search for "US population table" in Google. As the first answer, you will find a table of the US population from 1911 to now. Due to statistical discrepancy, you should forget the data after 2000.

Find the least square approximation of this data set by a quadratic function  $P = f(Y)$ , where  $P$  is the US population in the given year  $Y$ . You may use the Matlab function `qrfact` that you have previously implemented.

Then find the least square approximation of the data set  $(Y, \log P)$  by a linear function  $\log P = g(Y)$ . This gives you an exponential approximation  $P \approx e^{g(Y)}$ .

Which one of the quadratic and the exponential approximations fits the data set better, in least squares terms?

(*i.e.*, compare the expected values  $E[(P - f(Y))^2]$  and  $E[(P - e^{g(Y)})^2]$ )