Coding Exercise 1

Note: Do not import any library other than *numpy*.

1. Write a code to obtain a positive integer as the input, and spell the number digit-by-digit. For example, if the input is 4503, your code should print "four five zero three".

2. Write a code to compute the greatest common factor and the least common multiple of two numbers.

3. Write a code to compute all the saddle points of a given matrix along with the locations in the matrix. Recall that a saddle point is an element of a matrix that is simultaneously the maximum of a row and the minimum of a column, or the minimum of a row and the maximum of a column.

4. Write a code to compute the product of two polynomials $a_0 + a_1x + a_2x^2 + \cdots + a_nx^n$ and $b_0 + b_1x + b_2x^2 + \cdots + b_mx^m$. In other words, given two vectors $[a_0, a_1, \ldots, a_n]$ and $[b_0, b_1, \ldots, b_m]$, your code should print the product vector of length $(n + m + 1)$.

5. Write a code to sort n numbers in the ascending order. You should not use any in-built commands to sort the numbers.

6. Write a code to print the row reduced echelon form of a given matrix. You need to write the code using the basic principles without using any in-built commands. Check if your code works well for the following matrices.

$$A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 5 & 6 & 7 & 8 \\ 9 & 10 & 11 & 12 \end{bmatrix}, \quad A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 8 & 10 \end{bmatrix}$$

7. Assume that you are given a square matrix. Can you extend the code in the previous question to compute the determinant of the matrix?