to be prepared for 10th October

Exercise 1. Consider the polynom

$$f = x^5 - x^4 + x^3 - x^2 + x - 2$$

1. Compute the zeros of f numerically. You have influence on floating point precision, if you want to.
2. Generate a picture of the graph of the polynomial function $x \mapsto f(x)$ on an interval $[a, b]$. Choose a and b in such a way that you can 'see' the real zeros of f.
3. Compute the zeros of f symbolically. Which output comes from your computer algebra system?
4. Compute the zeros of the polynomial

$$f = 2x^2 + 2x^3 + 2x^4 + x^5 - x^6 + 3x + 1.$$

Exercise 2. Use a computer algebra system of your choice to compute the formal sums

$$\sum_{i=1}^{n} i^3 \text{ and } \sum_{i=1}^{n} i^4$$

Exercise 3.

1. Compute the integral $\int_0^1 \sin(x^2)dx$.
2. Compute the indefinite integral $\int \sin(x^2)dx$.

Exercise 4. Produce a picture of the following surfaces.

1. $z = x^2 \sin(y^2)$
2. $x = \cos(st),\ y = s\sin(t + \pi),\ z = t.$

Exercise 5. Given the matrix

$$A = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 2 & 3 & 4 & 5 & 1 \\ 0 & 0 & 0 & 1 & 2 \\ 0 & 0 & 0 & 2 & 3 \\ 0 & 0 & 0 & 3 & 4 \end{pmatrix}.$$

Compute all solutions of the linear system $A(x_1, x_2, x_3, x_4, x_5)^T = (1, 2, 3, 4, 5)^T$. Do it with the aid of a computer algebra system of your choice.