Solve the following three exercises:

Exercise 1. [30 points]

The table below shows a company's turnover over some years, in thousands of euros.

Year	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Rank of the Year x_i	1	2	3	4	5	6	7	8	9	10
Turnover in thousands of euros y_i	167	164	159	156	149	148	144	134	131	129

1. Calculate the linear correlation coefficient and interpret the answer.
2. Write an equation of the linear regression line $D_{y/x}$ of y on x.
3. Under this model, what is the turnover of this company in 2018 ?
4. In fact, the turnover in 2018 is 20 thousand of euros. Calculate the percentage of the error made with the previous estimate.
5. In which year the turnover reaches zero?

Exercise 2. [30 points]

A two-stage game is offered in a local casino. It consists of the player throwing a die in a first step, then in a second step he draws a token in an urn chosen according to the result of the die. The urn U1 is chosen when the die gives 1 or 2. The urn U2 is chosen when the die gives 3 or 4 and the urn U3 for 5 and 6.

The urns contain the following tokens:

- Urn U1: two red tokens, two blue tokens.
- Urn U2: two blue tokens, four green tokens.
- Urn U3: a green token, a red token.

1. What is the probability of obtaining a blue token given that it comes from the urn U1?
2. What is the probability of getting a blue token and that the token comes from the urn U1?
3. What is the probability that the player will get a red token?
4. The player gets a green token. What is the probability that this token comes from the urn U2?

Exercise 3. [40 points]

Consider the function f defined over $[0, +\infty[$ by $f(x) = (x-2)e^{-x} + 1$ and its representative curve (C) in an orthonormal system (O, i, j).

1. Calculate $\lim\limits_{x \to +\infty} f(x)$. Deduce an asymptote to (C).
2. Determine $f'(x)$.
3. Show that $f'(x)$ can be written in the form $f'(x) = (3-x)e^{-x}$.
4. Determine the table of variation of f.
5. Sketch (C).
6. (a) Show that the function F defined over $[0 ; +\infty[$, by $F(x) = (-x+1)e^{-x} + x$ is an anti-derivative of f.

   (b) Deduce the area of the region bounded by (C), the x-axis and the lines with equations $x = 0$ and $x = 1$.