1.
A. Compute $f'(x)$ and $f'_y(x, y)$!

- $f(x) = \sqrt[3]{(2x)^5} - \frac{x}{\sqrt[3]{5x}} + \ln(3(x-4))$

- $f(x) = \ln x e^{x^2 - 1}$

- $f(x) = \frac{\tan(2x)}{x + (3x)^2}$

- $f(x, y) = \frac{y - x}{2y + 3x}$

B. Compute the following definite integrals!

- $\int_0^1 e^{3x} \cdot (2x)\, dx$

- $\int_1^2 e^{3x^2} \cdot 2x\, dx$

2.

- There are 3 black and 5 white balls in a box. Suppose that we NOT DO put back the balls after the drawings. What is the chance of drawing firstly3 white and then 2 black balls? What is the chance of drawing 3 white and 2 black balls if the order is irrelevant?

- Suppose that we roll a dice. Six numbers (from 1 to 6) can appear face up with equal chances. So our sample space is: $\Omega = \{1, 2, 3, 4, 5, 6\}$. Define the events E and F as follows: $E = \{\omega \mid \omega \text{ is odd}\}$, $F = \{\omega \mid \omega < 4\}$. Are E and F independent? Prove your answer!
  How much are $P(E|F)$ and $P(F|E)$?

- There were two boxes, one containing 10 silver and 5 gold coins, while the other had 10 gold and only two silver coins. I was allowed to draw a random coin from the box of my choice. I got a silver coin, so I took the other box. What was my chance that I picked the box almost full of gold?

3.
A. Let $f(x) = 5x - 2x^2$. Compute $\frac{f(3+\Delta x_n) - f(3)}{\Delta x_n}$! What is the limit of this fraction as $n \to \infty$ if $\Delta x_n = 1/n^2$? How much is $f'(3)$?

B. Study the following sequences! (convergence, limit, monotonicity, upper and lower bounds)

- $\frac{3 + 4nn}{2n + 1}$,

- $\frac{(-1)^n}{2n^3 + 1}$.

C. Let $f(x, y) = 5 - y^2 + 3x - x^3$. Where are the critical points of this function? What are their types?
4. Let $f(x) = x^2 - x^3$. Plot f, determine its domain, range and roots, find its local minima and maxima, find the intervals where it is increasing or decreasing, convex or concave.