Exercise Sheet 1

Exercise 1 :

1. Recall the notion of a random variable and how to compute the expected value of discrete and continuous random variables.

2. Let X and Y be two random variables with $Y \sim \mathrm{U}([0,1])$ and X taking a value of 1 with the probability 0.4 and a value of 0 with the probability 0.6. Calculate $\mathbb{E}(X)$ and $\mathbb{E}(2Y)$.

3. Consider the random experiment "rolling a regular die once" and define a random variable Z that gives the number that is rolled. How is Z distributed? Assume that you receive a payment of z^2 when the die shows the number z. What is the expected payment you get?

Exercise 2 :

1. Let $f(x,y) = y^2 \ln(x) - y$. Compute $\frac{\partial f(x,y)}{\partial x}$ and $\frac{\partial f(x,y)}{\partial y}$. What is the geometric interpretation of $\frac{\partial f(x,y)}{\partial x}$?

2. Recall the definition of concave functions in one real variable.

3. Compute $\max\limits_{x \in \mathbb{R}} g(x)$ with $g(x) = -2x^2 + 32x + 7$.