MATHEMATICS

Homework 2. Logic

In the questions 1, 2 and 3 you have to choose one or several correct answers from the list, in the questions 4 and 5 you have to give a solution.

Question 1. Which of the following sentences are logical statements?

A Find the square root of 4.

B The number π is irrational.

C Is the number 91 prime?

D The lecture about combinatorics was fascinating!

E The number 28 is a multiple of 7.

F $e = 2,71828$.

Question 2. Which of the following statements is false?

A If the angle of a regular triangle is acute then the number 97 is prime.

B If the number 97 is prime then the elephants can play a piano.

C If the elephants can play a piano then $\pi < 3$.

D If $\pi < 3$ then the angle of a regular triangle is acute.

Question 3. Let x and y be integers. Which of the following statements are true?

A $\forall x \exists y (x^2 = y^4)$;

B $\forall x \exists y (x^4 = y^2)$;

C $\forall x \exists y (xy$ is a perfect square);

D $\forall x \exists y (xy = 1)$;

E $\forall x \exists y (xy = 0)$.

Question 4. For a real number x, consider the open sentences $P(x) : x \geqslant 3$ and $Q(x) : x^2 > 9$. Give an example of x such that

A the statement $P(x) \Rightarrow Q(x)$ is true;

B the statement $P(x) \Rightarrow Q(x)$ is false.

Question 5. Construct the truth tables and check if it is always truth that:

A $(\neg A \wedge B) \vee \neg B$;

B $(A \vee B) \wedge \neg A$;.