

## EXAM 2 (duration: 25 minutes)

DatZ1143: Discrete mathematics for computing

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Name and surname:

Student number:

Date:

### Questions

(There are 5 questions with total 10 points.)

1. Let  $P(x)$  denote the statement “ $x^2 > x + 1$ ”, where  $x$  can be an integer.

1.a. Please give an example of  $x$  such that  $P(x)$  is true (1 point)

1.b. Please give an example of  $x$  such that  $P(x)$  is false (1 point)

2. Determine the truth value of each of these statements if the domain of each variable consists of all real numbers. Please write your answer after each statement (0.5 point each, 2 points in total)

- $\exists x(x^2 = 2)$
- $\forall y(y^2 + 2 \geq 2)$
- $\exists z(z^2 + 1 = 0)$
- $\forall t(t^2 \neq t)$

3. Please give a counter example to show that the statement

$$\forall x ((x - 5)^2 - 1 > 0)$$

is false, where  $x$  can be an integer (1 point)

4. Determine the truth value of each of these statements if the domain of each variable consists of all integers. Please write your answer after each statement (0.5 point each, 2 points in total)

- $\forall x \exists y (x = y^2)$
- $\forall x \exists y (x^2 = y)$
- $\forall y \exists z (y + z - 2 = 0)$
- $\forall y \forall z ((y + z + 1)^2 > 0)$

5. Write the negation of the statement

$$\forall x \exists y (x^2 + y^2 = 9),$$

where both  $x$  and  $y$  are real numbers. (3 points)