

Tag : Toetsen/21-22/I2M.21-22[v2].Test  
Course : **Intro to Math + Calculus 1A**  
Date : Friday September 24<sup>th</sup>, 2021  
Time : 13:45 – 14:45

**Motivate all your answers.**

**The use of electronic devices is not allowed.**

## **The answer form**

Use the answer form to write down your answers. Clearly fill out your name, student number and study programme. Any text outside a frame will be ignored.

## **Question types**

### **Final answer**

On the answer sheet, in the corresponding text frame you provide only one answer. Do not write down a calculation, explanation or motivation. If you do write down a calculation, explanation or motivation, it will not be taken into account for grading.

### **Open answer**

You provide a full calculation or motivation in the text frame corresponding to the question. The calculation or motivation will be graded.

## **Extra writing space**

If you need more space, you can write in the frame provided at the end of the answer form. Clearly refer to this space in the original answer.

1. [2 pt] *This is a final answer question. Provide your final answer (and only your final answer) on the answer sheet. Do not use this sheet.*

Let  $A = \{1 - \frac{3}{n} \mid n \in \mathbb{N}\}$ .

For each of the following: if it exists, determine its value, otherwise write 'does not exist'.

(i)  $\inf(A)$

(ii)  $\min(A)$

(iii)  $\max(A)$

(iv)  $\sup(A)$

2. [2 pt] *This is a final answer question. Provide your final answer (and only your final answer) on the answer sheet.*

Describe each of the following statements using only the symbols

$A, B, C, \overline{A}, \overline{B}, \overline{C}, \subseteq, \subset, \cup, \cap, =$ .

(You can use one symbol more than once, and you don't have to use all symbols.)

(i)  $\forall x : x \in B \leftrightarrow x \notin A$

(ii)  $\forall x : x \in C \rightarrow (x \in A \wedge x \in B)$

3. [3 pt] Let  $a, b, c \in \mathbb{Z}$ . Either prove or give a counterexample to the following statement:

If  $a + b$  is odd and  $b + c$  is even, then  $a + c$  is odd.

4. [4 pt] Use mathematical induction on  $n$  to prove that for all  $n \in \mathbb{N}$ ,

$$\sum_{i=0}^n 2^i = 2^{n+1} - 1.$$

5. *This is a final answer question. Provide your final answer (and only your final answer) on the answer sheet.*

In this exercise, you don't have to evaluate your final answer. For example, if you think a solution is  $3! + 2 \cdot 4!$ , you can use that expression as your final answer. Let  $A$  be the set of numbers with 7 digits, such that all digits are 0 or 1. For example,  $0010010 \in A$ .

(a) [1 pt] Determine  $|A|$ .

(b) [1 pt] How many elements of  $A$  consist of exactly three digits 1?

(c) [1 pt] How many elements of  $A$  consist of exactly three digits 1 and/or start with the digit 1?

**Total:** 14 points

# Answer sheet Introduction to Mathematics

September 24, 2021, 150232

Name : \_\_\_\_\_

Programme : \_\_\_\_\_

Student number : \_\_\_\_\_

1. Write only the answer in the frame below:

$\inf(A) =$

$\min(A) =$

$\max(A) =$

$\sup(A) =$

2. (a) Write only the answer in the frame below:

$\forall x : x \in B \leftrightarrow x \notin A$

2. (b) Write only the answer in the frame below:

$\forall x : x \in C \rightarrow (x \in A \wedge x \in B)$





