

1	2	3	4	5	6	7	8	9	10	11	12	13	Σ

Do not fill in this table.

A

Only for sorting.

Answer form

Introduction to Mathematics & Calculus 1A – Test – October 24, 2025

Full name in BLOCK LETTERS _____

Student number _____

Programme _____

⚠ FILL IN YOUR DATA AS SOON AS YOU RECEIVE THE EXAM ⚠

Question 1. No points are awarded for fewer than 3 correct answers. Fill in the correct answers:

(a) $\inf(A) =$

A	B	C	D
-2	-1	0	1

(b) $\min(A) =$

A	B	C	D
-2	-1	0	1

(c) $\max(A) =$

A	B	C	D
DNE			

(d) $\sup(A) =$

A	B	C	D
2	3	4	5

4 correct: 2 points
3 correct: 1 point
otherwise: 0 points

Question 2. No points are awarded for fewer than 3 correct answers. Fill in the correct answers:

(a) ☐ True

☐ False

(b) ☐ True

☐ False

(c) ☐ True

☐ False

(d) ☐ True

☐ False

A	B	C	D
T	F	F	F
F	F	T	F
F	T	F	F
F	F	F	T

4 correct: 2 points
3 correct: 1 point
otherwise: 0 points

Question 3. Write only your final answer in each box.

horizontal asymptote(s):

vertical asymptote(s):

Question 4. Write only your final answer in each box.

(a)

(b)

(c)

Question 5. Write your answers 1–4 in the corresponding spaces.

A

B

C

D

Question 6. Write a full calculation/argumentation clearly in the box.

Suppose for contradiction that the statement is false.

Then there exist $a, b \in \mathbb{Z}$ for which:

$ab + a + 1$ is odd,

a is odd,

AND b is even.

Therefore, $\exists n \in \mathbb{Z} : a = 2n + 1$
and $\exists m \in \mathbb{Z} : b = 2m$.

$$\begin{aligned}\text{Now } ab + a + 1 &= a(b + 1) + 1 \\ &= (2n + 1)(2m + 1) + 1 \\ &= 4nm + 2n + 2m + 2 \\ &= 2(2nm + n + m + 1),\end{aligned}$$

which is even, since $2nm + n + m + 1 \in \mathbb{Z}$.

This contradicts it being odd, so by contradiction the original statement is true.

Question 7. Write a full calculation/argumentation clearly in the box.

Basis Step

$$\text{For } n=0, \sum_{i=0}^n F_{2i} = F_0 = 0$$

Also $F_{2 \cdot 0 + 1} - 1 = 1 - 1 = 0$, so the statement holds when $n=0$.

Induction Step

Suppose that for ~~any~~ some arbitrary integer $k \geq 0$:

$$\sum_{i=0}^k F_{2i} = F_{2k+1} - 1 \quad (IH)$$

We need to show that $\sum_{i=0}^{k+1} F_{2i} = F_{2(k+1)+1} - 1 = F_{2k+3} - 1$

$$\text{Well, } \sum_{i=0}^{k+1} F_{2i} = \sum_{i=0}^k F_{2i} + F_{2(k+1)}$$

$$\begin{aligned} \text{by IH} &\rightarrow \ominus F_{2k+1} - 1 + F_{2k+2} \\ &= F_{2k+3} - 1, \end{aligned}$$

which is what we needed to show.

By induction, the statement is true for all integers $n \geq 0$.

Question 8a. Write a full calculation/argumentation clearly in the box.

3 is in the set, and all other 3 ^{digits} ~~numbers~~ range from 4 to 9. (6 possible digits)
Therefore $1 \cdot \binom{6}{3} = \frac{6 \cdot 5 \cdot 4}{3 \cdot 2 \cdot 1} = 20$ numbers.

Question 8b. Write a full calculation/argumentation clearly in the box.

The smallest element could be 2, 4, or 6.

There is no overlap, so we can use the sum-rule:

Smallest is 2: $1 \cdot \binom{7}{3} = \frac{7 \cdot 6 \cdot 5}{3 \cdot 2 \cdot 1} = 35$

Smallest is 4: $1 \cdot \binom{5}{3} = \frac{5 \cdot 4 \cdot 3}{3 \cdot 2 \cdot 1} = 10$

Smallest is 6: $1 \cdot \binom{3}{3} = 1$

By sumrule: $35 + 10 + 1 = 46$ numbers