UNIVERSITETET I BERGEN

KANDIDAT

172

PRØVE

# MNF130 0 Diskrete strukturer

| | |
|---|---|
| Emnekode | MNF130 |
| Vurderingsform | Skriftlig eksamen |
| Starttid | 20.05.2022 13:00 |
| Sluttid | 20.05.2022 16:00 |
| Sensurfrist | -- |
| PDF opprettet | 03.05.2024 10:58 |

**Information**

| Oppgave | Tittel | Oppgavetype |
|---|---|---|
| i | General info about the exam in MNF130, spring 2022 | Informasjon eller ressurser |

**Compulsory assignments**

| Oppgave | Tittel | Oppgavetype |
|---|---|---|
| 1 | Compulsory assignments | Tekstfelt |

**The exam**

| Oppgave | Tittel | Oppgavetype |
|---|---|---|
| 2 | The exam | Langsvar |

# 1 Compulsory assignments

This is a placeholder to put the marks for the compulsory quizzes and written assignments:

- 1 point for every passed quiz, maximum 10 points.
- the sum of grades on the written assignments, maximum 30 points.

**You don't need to fill anything here.**

**Knytte håndtegninger til denne oppgaven?**
Bruk følgende kode:

**9 2 3 1 3 8 5**

# 2 The exam

**Fill in your answer here or ask the invigilator for paper. It is important that you refer to what questions you are answering. This applies for both answers written directly in Inspera and on paper. Ex: 1a, 1b, 2a, 2b etc.**

Ord: 0

**Knytte håndtegninger til denne oppgaven?**
Bruk følgende kode:

**8 3 0 4 6 4 0**

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Tegneområde Drawing area

a

| $p \to q$ | $q \to r$ | $(p \to q) \to r$ | $p \to (q \to r)$ |
|---|---|---|---|
| t | t | t | t |
| t | f | f | f |
| f | t | t | t |
| f | t | t | t |
| t | t | t | t |
| t | f | f | t |
| t | t | t | t |
| t | t | f | t |

b

they are not eqivalent

$p = f$
$q = t$
$r = f$

$(f \to t) \to f \not\equiv f \to (t \to f)$

$t \to f \not\equiv t$

$f$

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Tegneområde Drawing area

C $(P \wedge 9) \rightarrow P$

$\neg(P \wedge 9) \vee P$

$(\neg P \vee \neg 9) \vee P$

$(\neg P \vee P) \vee \neg 9$

$\neg(\neg P \vee P) \rightarrow \neg 9$

$\neg P \vee P$ is allways true

$\neg$ true = false

false $\rightarrow x$ is allways true

D

$\exists n \forall m P(n,m)$ is false because

if $m = -n$ then $P(n,m)$ is false

$\forall n \exists m P(n,m)$ is true if $m = n \cdot n + 1$

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Tegneområde Drawing area

a

$A = \{1, 2, 3\}$

$B = \{3, 4, 5\}$

$C = \{5, 6, 1\}$

$$\overline{A \cup (B \cap C)} = (\bar{C} \cup \bar{B}) \cap \bar{A}$$

$$\overline{\{1,2,3\} \cup \{5\}} = (\{2,3,4\} \cup \{1,2,6\}) \cap \{4,5,6\}$$

$$\{4,6\} = \{1,2,3,4,6\} \cap \{4,5,6\}$$

$$= \{4,6\}$$

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Tegneområde / Drawing area

B

$F(n) = |n|$

if n is a set of non negative integers, then the funktion states $f(n) = n$

- it is injective because all f(n) Point to a unige number in the co-domane

- it is Surjective becaus all numbers in the co-domaine have a connection to a number in the domain

- it is bijective because the Previous two were true

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Tegneområde / Drawing area

$a_n = 2 \cdot 3^n$

c

$a_0 = 2 \cdot 3^0 = 2 \cdot 1 = 2$

$a_1 = 2 \cdot 3^1 = 6$

$P(n)$: $a_n + a_{n-1} - 12 a_{n-2} = 0$

$P(2)$: $2 \cdot 3^2 + 2 \cdot 3 - 12 \cdot 2 \cdot 3^0$

$= 18 + 6 - 24$

$= 24 - 24 = 0$

assume $P(n)$

$P(n+1)$: $2 \cdot 3^{n+1} + 2 \cdot 3^n - 12 \cdot 2 \cdot 3^{n-1} = 0$

$2 \cdot 3^2 \cdot 3^{n-1} + 2 \cdot 3 \cdot 3^{n-1} - 12 \cdot 2 \cdot 3^{n-1} = 0$

$2 \cdot 3^{n-1}(9 + 3 - 12) = 0$

$2 \cdot 3^{n-1} \cdot 0 = 0$

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Tegneområde / Drawing area

b gcd(240, 46)

| | | | |
|---|---|---|---|
| 240 | 46 | 5 | 10 |
| 46 | 10 | 4 | 6 |
| 10 | 6 | 1 | 4 |
| 6 | 4 | 1 | 2 |
| 4 | 2 | 2 | 0 |
| 2 | 0 | | |

gcd(240, 46) = 2

u · 240 + v · 46 =

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Tegneområde / Drawing area

a

it looks like for each input you sum up all output for all values smaller then the original input

$f(0) = 1$
$f(1) = 1$
$f(2) = 2$
$f(3) = 4$
$f(4) = 8$
$f(5) = 16$
⋮

$f(n) = f(n-1) \cdot 2$
non recursivly for $n > 2$

Which gives the formula $f(n) = 2^{n-1}$ for $n \geq 2$

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Tegneområde / Drawing area

b

$P(n)$: [illegible] $2^{n-1} = f(n)$

$P(2)$: $2^1 = f(2) = f(0) + f(1) = 2$

$P(n+1)$:

Left side

$2^{n+1-1} = 2^n$

right side

$f(n) = f(n-1) \cdot 2 = 2 \cdot 2^{n-1} = 2^n$

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Tegneområde Drawing area

C $n + n - 2$

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Tegneområde Drawing area

a

reflexive:

$((a,b),(a,b)) \in R \leftrightarrow a \cdot b = b \cdot a$

Symetrik:

$((a,b),(c,d) \in R \leftrightarrow a \cdot d = b \cdot c$

$((c,d),(a,b) \in R \leftrightarrow c \cdot b = d \cdot a$

$ad = bc = cb = da$

transitive:

if

$((c,d),(e,f)) \in R \leftrightarrow cf = de$

and

$((a,b),(c,d)) \in R \leftrightarrow a \cdot d = b \cdot c$

then

$((a,b),(e,f)) \in R \leftrightarrow af = be$

Making it an equivalence relation

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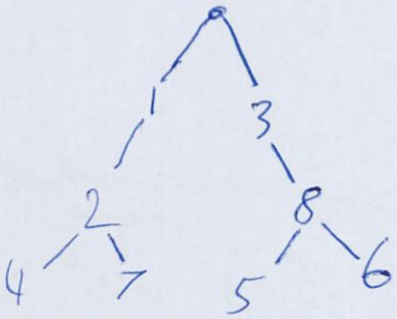
Tegneområde Drawing area

B




3, 8, 6, 5, 2, 7, 4

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Tegneområde Drawing area

| Vertex | Length | Path |
|---|---|---|
| a | 0 | a,a |
| b | 3 | a,b |
| d | 5 | a,b,d |
| c | 7 | a,c |
| e | 9 | a,b,d,e |
| f | 10 | a,b,d,e,f |