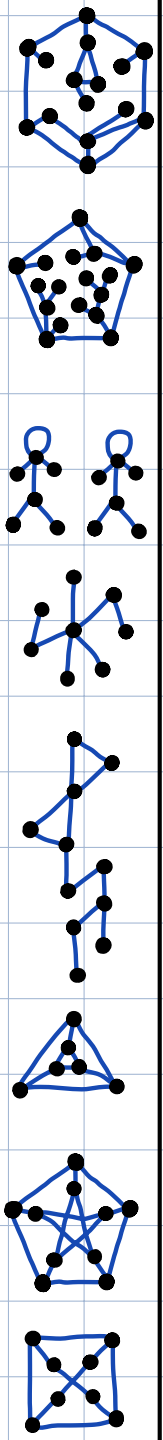
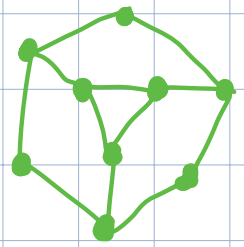
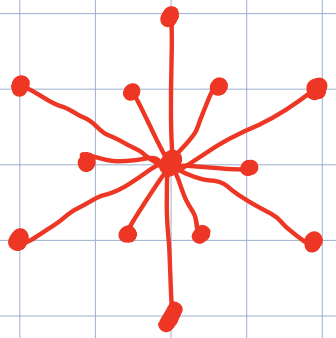
# Velkommen til repetisjonstime i IN1150!



## Grafer og Formelle språk



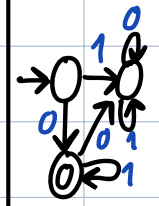


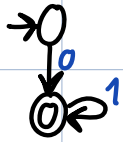
-Luna

arthuk@uio.no

{0, 01, 011, 0111, 01111, ...}

$01^*$




$S \to 0E$

$E \to 1E$

$E \to \Lambda$

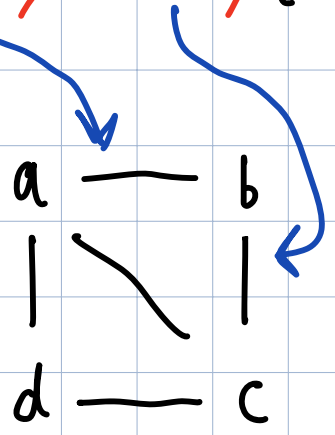
# Grafer

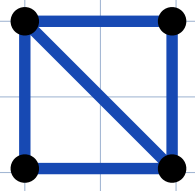
En graf G har en ikke-tom, endelig mengde V av noder, og en mengde E med kanter, på formen $\{a,b\}$, hvor $a,b \in V$ og $a \neq b$.

Eksempel:

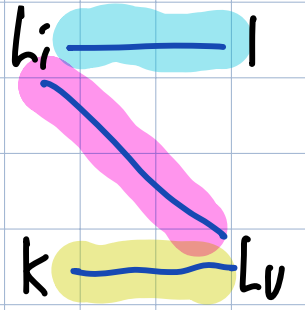
$V = \{a,b,c,d\}$

$E = \{\{a,b\}, \{b,c\}, \{c,d\}, \{d,a\}, \{a,c\}\}$



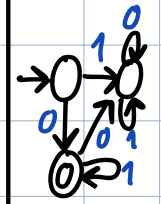
$V = \{$Lina, Ingela, Luna, kristin$\}$

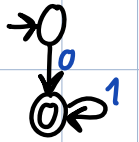



$E = \{$ {Lina, Ingela}, {Lina, Luna}, {Luna, kristin} $\}$

$\{0, 01, 011, 0111, 01111, \ldots\}$

$01^*$




$S \to 0E$

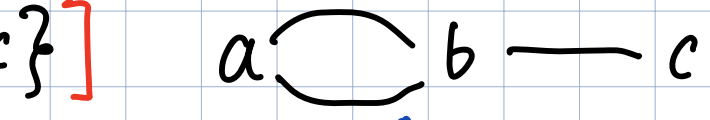
$E \to 1E$

$E \to \lambda$

# Andre typer grafer

Multigraf: Mengden kanter blir en multimengde

$E = [\{a,b\}, \{a,b\}, \{b,c\}]$




Parallelle kanter

Pseudograf: De to nodene i en kant kan være den samme

$E = \{\{a,a\}, \{b,b\}\} = \{\{a\}, \{b\}\}$

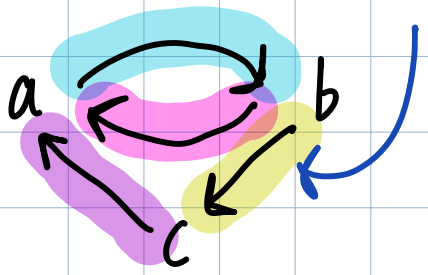



Løkker

Rettet graf: kantene er tupler

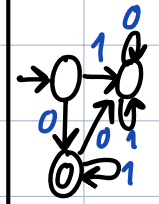
$E = \{\langle a,b\rangle, \langle b,a\rangle, \langle b,c\rangle, \langle c,a\rangle\}$

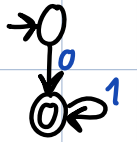
Rettede kanter



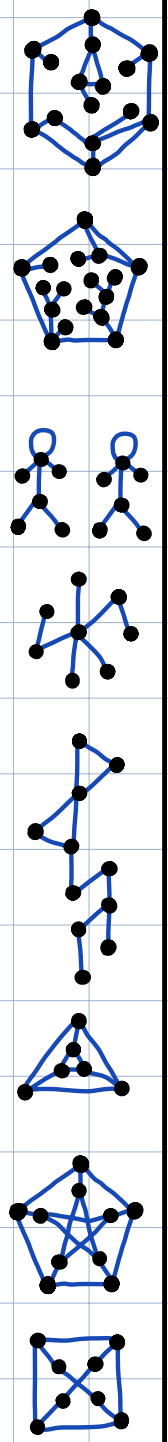

$\{0, 01, 011, 0111, 01111, \ldots\}$

$01^*$

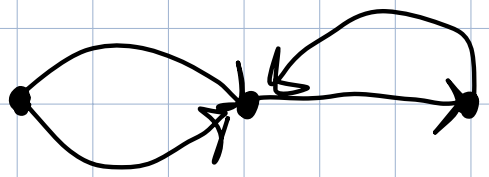


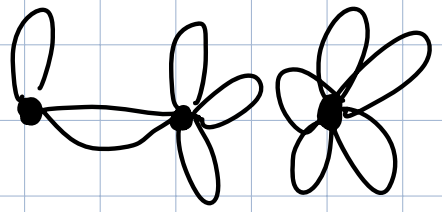

$S \to 0E$
$E \to 1E$
$E \to \Lambda$



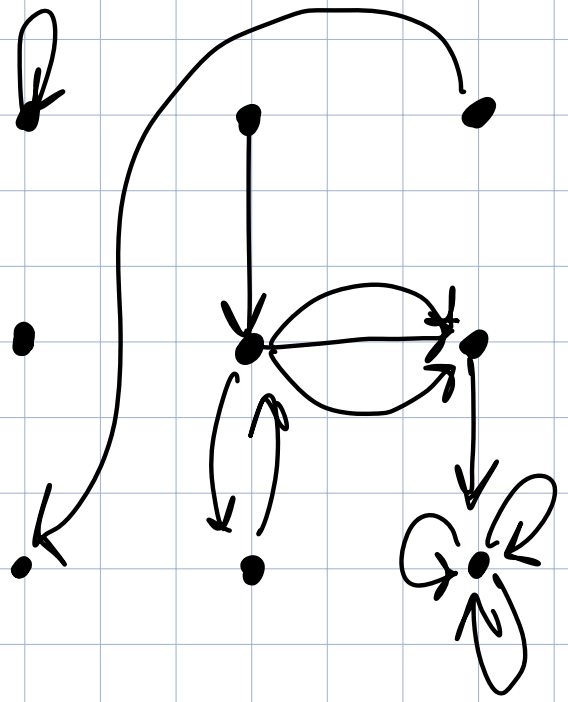
## Rettet multigraf



## Pseudomultigraf

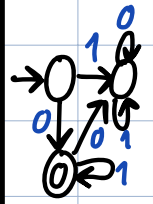


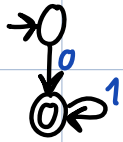
## Rettet pseudomultigraf



{0, 01, 011, 0111, 01111, ...}

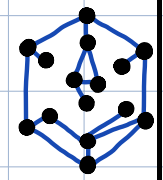
01*



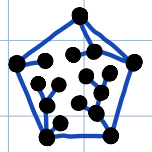




S → 0E
E → 1E
E → Λ

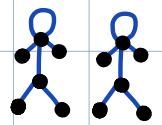
# Vandringer



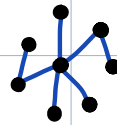
Sti: Ikke gjennom samme node flere ganger
Sykel: Sti hvor du ender opp der du startet



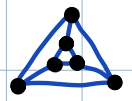
Hamiltonsti: Sti hvor du går gjennom alle nodene
Hamiltonsykel: Sykel hvor du går gjennom alle nodene

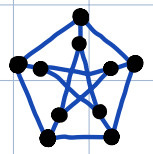


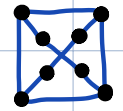
Vei: Ikke gjennom samme kant flere ganger
Krets: Vei hvor du ender opp der du startet



Eulervei: Vei hvor du går gjennom alle kantene
Eulerkrets: Krets hvor du går gjennom alle kantene

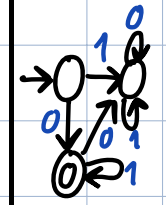


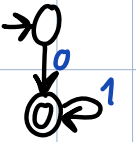




{0, 01, 011, 0111, 01111, ...}

01*

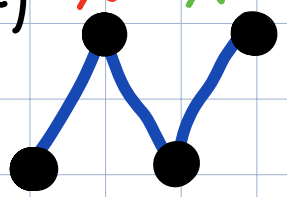


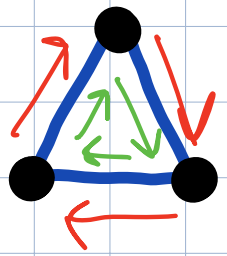

S → 0E
E → 1E
E → Λ

# Finnes Hamiltonsykler eller Eulerkretser?

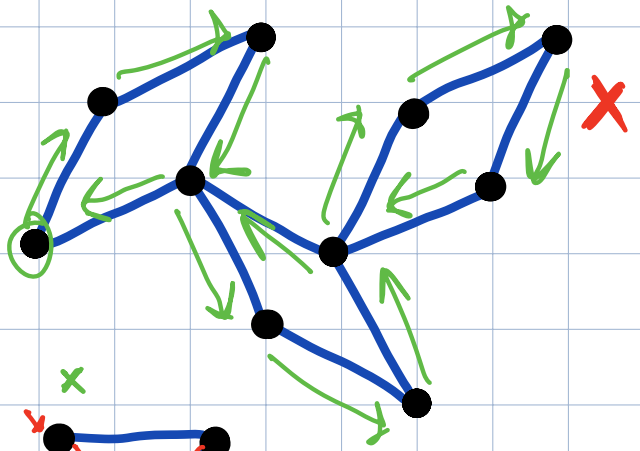
(a) X X



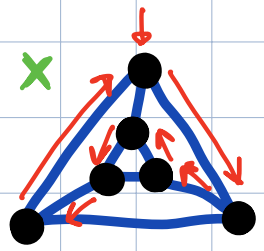
(b)



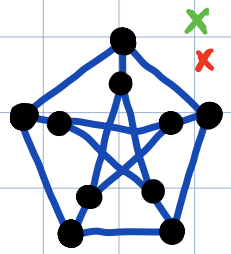
(c)



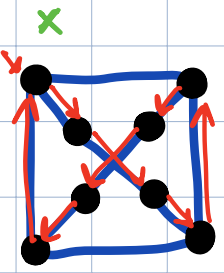
(d) X



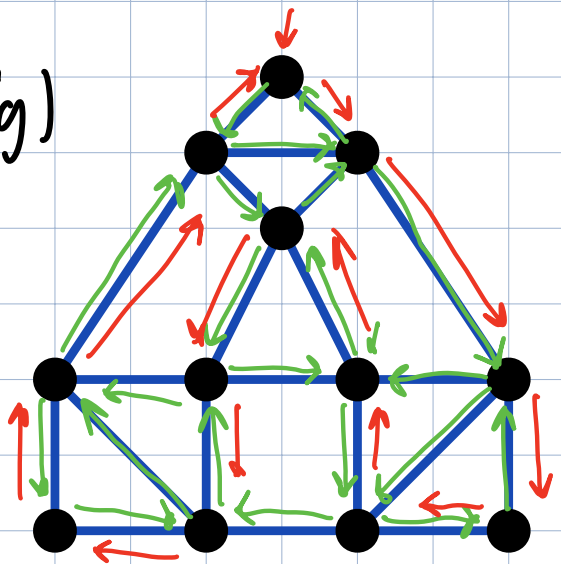
(e)



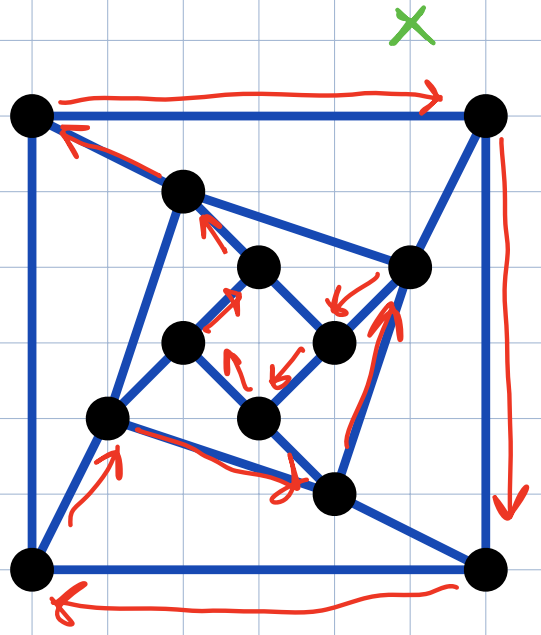
(f)



(g)

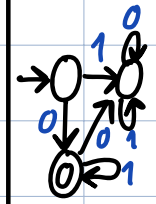


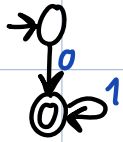
(h)



{0, 01, 011, 0111, 01111, ...}

$01^*$





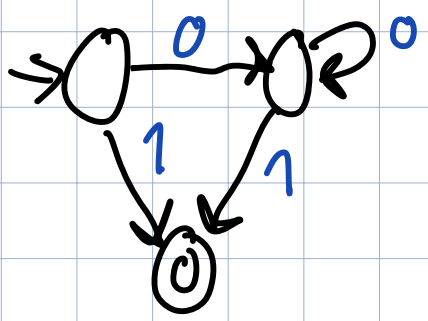
$S \to 0E$

$E \to 1E$

$E \to \lambda$

# Regulære språk

## Tilstandsmaskin

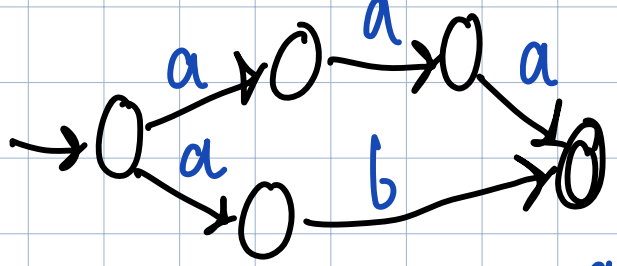



beskriver språket R

0001 ∈ R

0101 ∉ R

00 ∉ R




ab

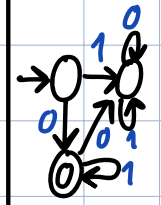
## Gramatikk

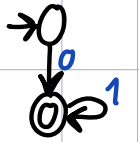
S → 1
S → 0T
T → 0T
T → 1

S → 0T → 00T → 000T → 0001

{0, 01, 011, 0111, 01111, ...}

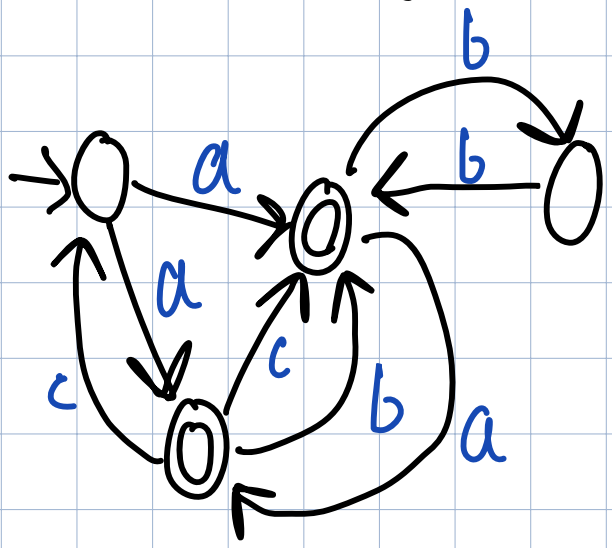
01*




S → 0E
E → 1E
E → λ

$A = \{a, b, c\}$



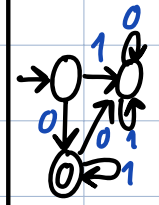

a b b a ✓

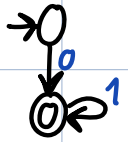
a b c ✗

a b b b a c a c ✓

$\{0, 01, 011, 0111, 01111, \ldots\}$

$01^*$




$S \to 0E$

$E \to 1E$

$E \to \Lambda$

# Regulære uttrykk

$R = 010$ $\quad L(R) = \{010\}$

$S = 00 \mid 11$ $\quad L(S) = \{00, 11\}$

$T = 0^*1$ $\quad L(T) = \{1, 01, 001, 0001, \ldots\}$

$U = (01)^*$ $\quad L(U) = \{\lambda, 01, 0101, 010101, \ldots\}$

$V = \lambda \mid 01 \mid 10$ $\quad L(V) = \{\lambda, 01, 10\}$

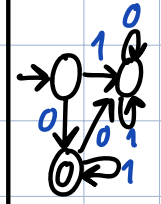
$W = (ab \mid bc)^* \mid cc^*$ $\quad$ Noen strenger i $L(W)$:

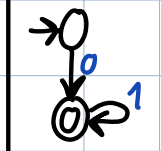
cccc
c
cc

ababbc
bcabbcbc
$\lambda$
ab
bc

{0, 01, 011, 0111, 01111, ...}

$01^*$

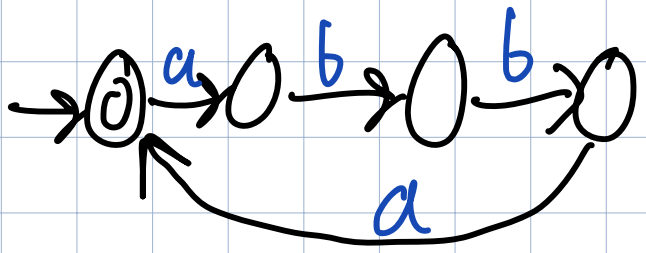



S → 0E
E → 1E
E → $\lambda$

# ABBA-Språket!

Ickedeterministisk tillståndsmaskin:




$\wedge$
abba
abbaabba
abbaabbaabba
⋮

Regulär gramatikk:

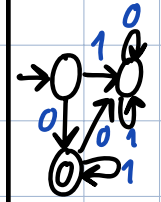
$S \to \wedge$
$S \to abbaS$

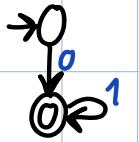
Regulärt uttryck:

$(abba)^*$

{0, 01, 011, 0111, 01111, ...}

$01^*$




$S \to 0E$
$E \to 1E$
$E \to \wedge$