# Extra exercises Math2 week2

## Linear algebra

Topics: vector form of a line and a plane, length of a vector, equation of a line.

EXERCISE 1 *(201906)*

Given are the following vectors

𝑎= and 𝑏=

Give a vector form of the plane **V** parallel to vectors a and b through the Origin.

EXERCISE 2 (201906)*)*

**V** is the plane given by the linear equation 2x + 3y - z = -9.

Calculate the intersection point of plane **V** and the line *l* given by the vector form:

𝑙= + 𝜆

2(3+λ) + 3(1-2λ) –(2+4λ) = -9

⬄ 6 + 2λ +3 -6λ -2 -4λ = -9

⬄ -8λ = -16 ⬄ λ = 2 intersection point = (5, -3, 10)

EXERCISE 3 *(20120119)*

4 3

Given the vector **v** = −1 and **w** = 0

1 −2

a. Give a vector **c** (not the zero vector), so that the 3 vectors **c**, **v** and **w** are dependent.   
**Explain your answer!**

Every combination of λ **v** + μ **w** is a correct answer, so for example:  
 **c** = **v** + **w =**

EXERCISE 4 *(20120119)*

Given are the three points A = (3,5,7), B = (-1,2,0) and C = (4,7,1)

Give a vector-form of the plane V through these three points.

A−B =, C−B = , so the vector-form can be: +λμ

EXERCISE 5 *(20120119)*

Given are the lines *l:*  = + λ and *m:*  = + μ

Find the intersection-point of the two lines (if there is such an intersection point).

Three equations: 2+λ = 1+3μ  
 -5+2λ=9-2μ  
 -1+λ=2+μ  
 Solution is λ=5 and μ=2. This gives the intersection-point (7,5,4)

## Languages

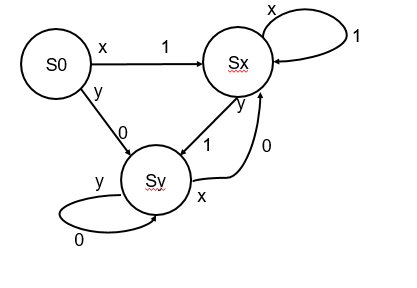
Topics: graph representation of a regular language, FSA, changing graph into FSA

EXERCISE 6 *(201906)*

Given the alphabet A={x,y,z}.

Change the following language graph on A into a finite state automaton.





EXERCISE 7 *(20120119)*

Given the alphabet A = {0,1, X}

and the regular expression r = (01 \/ 10)\* X

Give a graph that represents L(r). (It doesn't have to be a FSA.)

S1

***c***

***1***

***0***

***X***

S3

S0

S2

***1***

***0***

S1

***c***

***1***

***0***

***X***

S3

S0

S2

***1***

***0***

EXERCISE 8 *(20120119)*

L is a language over alphabet {*a, b, c*} given by the next graph:

***c***

***a***

S2

***a, b***

S1

S0

***a***

***b***

S3

a. Give a set notation for L.

b. Change this graph into a correct diagram of a finite state automaton of L (in case the  
 graph isn’t already a correct FSA).

a. {a,b} {c, ab}\* {a}

***c***

***a***

S2

***a, b***

S1

***b***

S0

***b***

***c***

***a, c***

***a, b, c***

SINK