# Extra exercises Math3 week3

Linear algebra: topics: dot product, cross product

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EXERCISE 2 *(2+5+5 points)*

Given are the vectors a = and b =

a) Are the vectors a and b perpendicular? (please explain your answer)

b) Find a vector perpendicular to a **and** b.

c) Find a vector form of the line perpendicular to a and b that passes through the point (1, 0, 1).

EXERCISE 3

Given are the vectors a = and b =

Now **V** is a planeparallel to vectors a and b through the Origin.

Give a linear equation for this plane V.

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EXERCISE 3 *(6+6+6 points)*

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

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

b. Give an equation of V.

c. Give the vector-form of the line perpendicular to V through A.

EXERCISE 4 *(7 points)*

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

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

Languages: topics: Finite State Machines (FSM), conversion of graph to FSA

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EXERCISE 7 *(13 points)*

Given the input alphabet A={x,y} and the output alphabet Z={0,1}.

There is a finite state machine M such that

* Any x preceded by an y will be changed into 0
* All other x’s will be changed into 1
* Any y preceded by an x will be changed into 1
* All other y’s will be changed into 0

So the input string xxyx will be converted into 1110

Give the state diagram (= graph) of the finite state machine M.

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EXERCISE 8 *(3+4+4 points)*

|  |  |  |
| --- | --- | --- |
| **F** | ***x*** | **y** |
| **S0** | S1 , 1 | S0 , 0 |
| **S1** | S2 , 2 | S0 , 0 |
| **S2** | S2 , 3 | S0 , 0 |

This is the state table of the finite state machine M. S0 is the initial state.

a. Mention:

1. the set A of input symbols
2. the set S of states

(iii) the set Z of output symbols

b. Determine the output string if the input string is *yxyxxx*.

c. Can you find an input-string for which the output-string contains the subword 03?  
 **Explain your answer.**

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EXERCISE 8 *( 5+5 points)*

This is the state table of the finite state machine M. S0 is the initial state:

x y

s0 s1, 0 s2, 0

s1 s1, 1 s2, 0

s2 s0, 1 s1, 1

a. Draw a diagram for this M

b. Give the output string if the input string is xxyxy.