Lineare Algebra\_A01

Aufgabe 1:

1. Richtig, weil a ein Element der Menge ist
2. Falsch, weil 0 nicht Element der Menge ist, sondern ein Element der Menge in der Menge
3. Richtig, weil a ein Element der Menge a ist
4. Richtig, eine Teilmenge ist genau dann eine Teilmenge, wenn jedes Element a auch in a vorhanden ist; FALSCH, da eine Teilmenge nur Sinn macht, wenn auf beiden Seiten eine Menge steht
5. Falsch, eine leere Menge beinhaltet nichts und kann somit nicht ein Element von 0 sein
6. Falsch, da eine leere Menge nichts beinhaltet, somit kann 0 kein Element einer leeren Menge sein
7. Falsch, eine leere Menge beinhaltet nichts, somit kann es kein Element sein
8. Richtig, da ∅ diesmal in einer Menge steckt {∅} und somit ein Element davon ist

Aufgabe 2:

1. P(M) := { ∅ , {c}, {3}, {α}, {c, 3}, {c, α }, {3, α }{c, 3, α }}
2. P(M) := { ∅, {∅},{{∅}} {∅,{∅}}} --- P(∅) := {∅}, P(P(∅)) := {∅, {∅}}
3. P(M) = {∅, {(-1,a)}, {(-1,z)}, {(1,a)}, {(1,z)}, {(-1,a), (-1,z)}, {(-1,a), (1,a)}, {(-1,a), (1,z)}, {(-1,z), (1,a)}, {(-1,z), (1,z)}, {(1,a), (1,z)}, {(-1,a), (-1,z), (1,a)}, {(-1,a), (-1,z), (1,z)}, {(-1,a), (1,a), (1,z)}, {(-1,z), (1,a), (1,z)}, {(-1, a), (-1, z), (1, a), (1, z)}}  
     
   M = {(-1, a), (-1, z), (1, a), (1, z)},
4. Es gibt 2^m viele Elemente, da immer die Elemente an sich vorkommen und die Kombination + der leeren Mengen dazu

Aufgabe 3:

a)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| A | B | C | (B ∩ C) | A \(B ∩ C) | (A\B) | (A\C) | (A \ B) ∪ (A \ C) |
| 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 |
| 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 |
| 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Richtig

b)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| A | B | C | (B ∪ C) | A\(B ∪ C) | (A\B) | (A\C) | (A \ B) ∩ (A \ C) |
| 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 |
| 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 |
| 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Richtig

c)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| A | B | C | (B ∪ C) | A ∩ (B ∪ C) | (A∩B) | (A∩C) | (A ∩ B) ∪ (A ∩ C) |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 0 | 1 | 1 | 1 | 0 | 1 |
| 1 | 0 | 1 | 1 | 1 | 0 | 1 | 1 |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Richtig

d)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| A | B | C | (B ∩ C) | A ∪ (B ∩ C) | (A∪B) | (A∪C) | (A ∪ B) ∩ (A ∪ C) |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 |
| 1 | 0 | 1 | 0 | 1 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Richtig

Aufgabe 4:

M△N := (M \ N) ∪ (N \M)

a)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| M | N | O | (M\N) | (N\M) | (M\N) ∪ (N\M) = **Y** | (Y\O) | (O\Y) | (Y\O) ∪ (O\Y) |
| 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 |
| 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 |
| 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 |
| 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 |
| 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 |
| 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| M | N | O | (N\O) | (O\N) | (N\O) ∪ (O\N) = **Y** | (M\Y) | (Y\M) | (M\Y) ∪ (Y\M) |
| 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 |
| 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 |
| 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 |
| 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Richtig

b)

Richtig

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| M | N | O | (M\N) | (N\M) | (M\N) ∪ (N\M) | (N\M) ∪ (M\N) |
| 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| 1 | 0 | 1 | 1 | 0 | 1 | 1 |
| 1 | 0 | 0 | 1 | 0 | 1 | 1 |
| 0 | 1 | 1 | 0 | 1 | 1 | 1 |
| 0 | 1 | 0 | 0 | 1 | 1 | 1 |
| 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 |

c)

M△N = ∅ **⇔** M = N

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| M | N | (M\N) | (N\M) | (M\N) ∪ (N\M) |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 |

Richtig, weil wenn M und N gleich ist, dann wäre M△ N auch N △N oder M△M und somit eine leere Menge